# Demand for and applications of extra large EDP systems in the EEC Countries and the United Kingdom in the seventies

## Vol. 5 - Future demand for extra large EDP systems in Public Administration

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The survey was conducted for the "Commission des Communautés Européennes (Direction Générale des Affaires Industrielles)".

The survey was conducted by a research group from SORIS, consisting of: Andrea Barabino, Serena Girardi, Donata Leonesi, Guido Musso, Iacopo Muzio, Piero Taverna.

Collaborated have:

Enrico Albani, Giustino Gasbarri, Alfredo Mantica, Massimo Merlino, from Praxis Calcolo

Antonio di Leva, Graziella Pent, Maria Teresa Reinieri, from the University of Torino

Rinaldo Sanna from the University of Genova

The interviews with users and experts have been conducted by:

| | |
|---|---|
| SORIS | in Italy and the United Kingdom |
| SOBEMAP of Brussels | in Belgium |
| SEMA of Paris | in France |
| Deutsche Revisions-und Treuhand A.G. Treuarbeit of Frankfurt | in Germany |
| Rijkskantoormachine-centrale of 'S Gravenhage | in Holland |

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SORIS s.p.a.
Economic Studies and Market Research
11, via Santa Teresa Turin tel. 539865/66

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# CHAPTER XI

## Future demand for extra large EDP system in Public Administration

CONTENTS

## Introduction

In this study the term "Public Administration" has been used to indicate:

- ministries of the central government,
- state governments in countries with federal structures,
- local authorities, either elected or nominated from above,
- government agencies managing the many different types of public initiatives (social securities, city planning, etc.).

Excluded are firms and organizations, fully or partly state owned, which give evidence of the increasing responsibilities government organizations are assuming in the field of production and which are analyzed separately in their respective field of economic activity.
Decisive for the choice was the consideration that since Public Administration has assumed the role of entrepreneur, its behaviour must be subject to the same rules which apply to private firms and which are obviously different from those required for the management of public affairs.
Despite this limitation, it is very difficult to make a uniform analysis of current applications and future EDP developments in Public Administrations of the EEC countries and the UK.
The difficulties arise mainly from the difference in functions which government performs in the different countries: these reflect not only the different social and economic development levels, but also the different historical-political developments.

At present, great differences can be noticed in the tasks performed by Public Administrations in the examined countries, and these could become even greater in the future. In fact, they reflect collective choices based on values and contingent situations which are not necessarily homogeneous. It has therefore been considered useful to examine only those EDP applications which are increasingly important in the Public Administrations of the countries under examination. Effective performance of these tasks will require EDP solutions employing extra-large data processing systems.

The choice is obviously not exhaustive: it reflects the often fragmentary indications which have emerged from the direct survey and excludes applications peculiar to some of the countries examined, as well as the less innovating ones, which can, however, be realized, but do not imply necessarily the employment of high performance computers. It must also be added that applications in military organizations have not been included: for obvious reasons it is difficult to obtain information about this type of application.

Since the hypothized EDP issues are often closely related to the institutional features of the countries examined, it has been considered useful to indicate briefly the institutions able to perform the indicated functions. The current and future considerations are, at any rate, based on the hypothesis of a substantial stability of the current institutional characteristics. With the exception of cases, such as Italy, where deep institutional reforms have already been launched, this more cautious proceeding has been preferred to the formulation of fictional political

hypotheses.

In particular, the hypothesis of Europe's political unification in the seventies has not been considered which, of course, would change greatly the observations of this survey.

To the limitations already mentioned there must be added those which derive from the modest resources available to this survey and which have influenced particularly strongly the representativity in the direct survey conducted in the EDP centres of Public Administrations of the countries considered.

In total, 22 interviews were conducted in this sector, and they can be broken down per country as follows:

| | |
|---|---|
| Belgium | 4 |
| France | 2 |
| Germany | 3 |
| Italy | 8 |
| Holland | 4 |
| United Kingdom | 1 |

More information about EDP applications in Public Administrations of certain countries have determined the choice of applications examined.

In order to integrate the scarce information made available by the interviews, especially about the newer applications, we have made abundant use of the available bibliographical documentation which is, however, also not very exhaustive, because of the delay of computer diffusion in Public Administration.

Finally, there are difficulties in formulating forecasts on Public Administration behaviour toward EDP during the next decade: also in this respect its choices will obviously be guided by the objectives, problems, difficulties and knowledge of the different countries during the period under consideration.

Also if long term objectives were firmly formulated, the behaviour of a state's bureaucratic structure would be another factor in the already existing uncertainty of the forecasts. This behaviour can accelerate or delay interventions, or can even be such an obstacle as to change substantially the prospects for development.

It is therefore advisable to exclude quantitative formulations of forecasts and indicate the gradual development of the various information subsystems only in rational terms, on the assumption of a global approach to EDP by the Public Administration.

Such a total approach is warranted by the most recent techniques of government management and is the only one which gives Public Administrations the possibility to recuperate the time lost in the sixties in this respect. For each of the subsystems the stages of realization, which differ from one subsystem to another, have then be pointed out as well as the technical times necessary.

## 2. Structure (1)

Among the structural features of the countries under examination those most likely to influence to a great extent a government's behaviour towards EDP are, above all, the unitary or federal structure of the State. In this respect the Federal Republic of Germany finds itself in a peculiar position within the framework of the countries considered, being the only country with an essentially federal structure, in which the "Länder" (2) possess sovereignty and hence a wide range of jurisdiction, while the jurisdiction of the federal state is constitutionally limited, even if it tends to increase progressively. Also the United Kingdom shows some peculiarities in this respect, because it joins with Great Britain the Isle of Man, the Channel Islands and Northern Ireland, each with a large degree of self-government with the exception of a few competences.

In all the other countries considered, an increasingly larger part of public functions are taken over by the central government, the only one able to assure uniform management of public services; at any rate, they are always performed under the control of the central government.

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(1) Luxermburg has not been examined separately because its small size places it below the minimum threshold necessary for the use of extra-large processing systems.

(2) Schleswig-Holstein, Hamburg, Niedersachsen, Bremen, Nordrhein-Westfalen, Hessen, Rheinland-Pfalz, Baden-Württemberg, Bayern, Saarland, West Berlin.

The decline of local administrations seems to be due to obsolete territorial structures and to dimensions unable to cope with local problems which today mean basically the needs and problems of large metropolitan complexes. It is therefore possible that within the next ten years important reforms will take place in the European countries, such as the regional reform already launched in Italy or the creation of the Greater London Council in the United Kingdom and of the District of the Region of Paris in France. These new institutions will probably set up the EDP applications hypothesized in this research at local government level.

Another very important aspect of the organization of these countries for the application of EDP in Public Administration is the existence or not of a national economic planning policy. Onlt through the organs of economic planning does it seem possible to rationalize in all fields the Public Administration's choices which reflect, on the one hand, the information coming from private decisional centres and, on the other hand, affect the behaviour of the latter. Economic planning policies, even if of different character and possibilities of influencing economic patterns, are being carried out now in the majority of the countries examined.

In particular: in Holland through the Centraal Planbureau, in France through the Commissariat Général du Plan, in Italy through the Ministero per il Bilancio e la Programmazione Economica (and in particular the general Secretariat of Planning) and in the United Kingdom the Ministry for Economic Affairs and the National Economic Development Council.

It is more difficult to recognize an economic planning policy in Germany (where there esists a budget policy put into a medium term planning scheme) and in Belgium. Given the present differences among the various countries, even with existing planning policies, EDP applications have been examined only in the context of planning activities by the Public Administration, i.e. programmed planning of revenues and government expenditures (PPBS).
The increase in the tasks governments have to perform today is directly proportional to the increase in government revenues and expenditures in all the countries involved in this survey.
This is illustrated in the following table which comprises all administrations (central government, local government, social secutiry) of the EEC countries in 1968. Revenues and expenditures accounted in 1968 for a considerable share of the GNP.

| Country | Percent of total government revenues on GNP |
|---|---|
| | % |
| Belgium | 33 |
| France | 37 |
| Germany | 36 |
| Italy | 33 |
| Holland | 41 |
| United Kingdom | 39 |
| United States | 31 |

Depending on the country, government expenditures are a more or less important factor in the general economic policy, exerting their influence on both economic recession and development.

Thus, planning of government expenditures becomes the nucleus of any economic planning.

TABLE XI-1 PUBLIC ADMINISTRATION IN THE EEC COUNTRIES-1968

(millions of $)

| | GERMANY | FRANCE | ITALY | NETHERLANDS | BELGIUM |
|---|---|---|---|---|---|
| PROPERTY INCOME | 2,477.5 | 772.4 | 1,471.4 | 533.1 | 124.0 |
| INDIRECT TAXES | 18,092.5 | 20,240.6 | 9,408.2 | 2,826,0 | 2,756.0 |
| CORPORATION INCOME TAXES | 2,770.0 | 2,339,4 | 1,301.4 | 698.9 | 428.0 |
| INDIVIDUAL INCOME TAXES | 10,930.0 | 6,027.6 | 3,782.2 | 2,629.8 | 1,684.0 |
| SOCIAL CONTRIBUTION | 13,907.5 | 18,522.0 | 8,300.2 | 3,392.3 | 1,966.0 |
| OTHER TRANSFERS FROM FIRM TO FAMILIES | 532.5 | | 528.5 | 190.6 | |
| TRANSFERS FROM OTHER PUBLIC AGENCIES | - | - | - | - | - |
| TRANSFERS FROM FOREIGN COUNTRIES | 257.5 | 188.0 | 28.6 | 74.6 | 8.0 |
| CURRENT RECEIPTS | 48,967.5 | 48,090.0 | 24,820.5 | 10,345.3 | 6,966.0 |
| INTERESTS ON GOVERNMENT DEBTS | 1,132.5 | 1,668.3 | 1,662.7 | 707.2 | 630.0 |
| SUBVENTIONS | 1,455.0 | 3,449.0 | 1,402.6 | 198.9 | 308.0 |
| TRANSFERS TO FAMILIES | 18,670.0 | 21,424.1 | 10,455.5 | 4,129.8 | 2,922.0 |
| TRANSFERS TO OTHER PUBLIC AGENCIES | - | - | - | - | - |
| TRANSFERS TO FOREIGN COUNTRIES | 1,135.0 | 1,219.4 | 150.6 | 107.7 | 102.0 |
| CONSUMPTION EXPENDITURES | 20,912.5 | 16,246.5 | 10,100.8 | 3,878.5 | 2,948.0 |
| (MILITARY) | (4,217.5) | (4,897.9) | (1,635.7) | (845.3) | (608.0) |
| CURRENT EXPENDITURES | 43,805.0 | 44,007.3 | 23,772.2 | 9,022.1 | 6,910.0 |
| SAVINGS | 5,662.5 | 4,083.7 | 1,048.3 | 1,323.2 | 56.0 |

SOURCE: EEC/1969.

## 3. Data processing equipment

### 3.1. In European Countries

Even more difficult than in the other sectors of the economy is it to obtain uniform information in the countries examined about computer equipment in Public Administration. Besides the factors already observed the different extension of this sector is making comparison more difficult. Depending on the structural features of the countries and on sources of information differing even within the same country, this sector can comprise or not the defense equipment (considered in almost all countries a military secret, with the exception of the United Kingdom), university centres (at least in those countries where universities are public), public research centres, government-controlled organizations, nationalized firms, etc.
The data examined here must be interpreted very cautiously as they come from government statistics as well as from direct survey.
Introduction of computers into government has taken place in Europe with a certain delay as compared to other sectors of activity and with a considerable delay when compared to the US government.

In that country the major part of the installations is employed in atomic energy, defense and space research, fields to which European countries dedicate much less funds.
An attempt made by OCDE (1) to compare (for 1966) the percentage of all the Public Administrations on the computer market shows the following results:

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(1) OCDE - "Ecarts technologiques entre pays membres, Calculateurs électroniques", Paris 1968.

Percentage of government installations of the total

| Country | Number | Value |
|---|---|---|
| United States | 9 | 14 |
| United Kingdom | 20 | n.d. |
| France | n.d. | 20 |
| Germany | 10 | n.d. |
| Italy | n.d. | 23 |
| Japan | n.d. | 15 |

The US government's presence on the computer market is not so strong, even if its installations are very important. To a certain extent in the EEC countries and the United Kingdom it is possible to distinguish equipment in central and local governments during one year. This was done by W.K. De Bruijn (1) for 1966 and the results are the following:

| COUNTRY | CENTRAL GOVERNMENT | | LOCAL GOVERNMENT | |
|---|---|---|---|---|
| | Number of computers | % of the total number of computes | Number of computers | % of the total of number of computes |
| BENELUX | 40 | 5.9 | 34 | 5.0 |
| FRANCE | 58 | 5.6 | 68 | 6.6 |
| GERMANY | 51 | 3.5 | 176 | 12.0 |
| ITALY | 52 | 8.7 | 55 | 9.2 |
| TOTAL EEC | 201 | 5.3 | 333 | 8.8 |
| UNITED KINGDOM | 105 | 5.9 | 234 | 13.1 |

(1) W.K. De Bruijn, Computers in Europe in 1966.

It is difficult to make a similar, but more up to date comparison using data collected during this survey. Because of the considerable disparity of the sources, we have attempted to give the percentages of government's computer equipment (in number) as compared to the total number of installations in the country (1):

| Country | Computers installed in Public Administrations (% on total) |
|---|---|
| France (1968) | 17.1 |
| Germany (1967 | 5.0 |
| Italy (1968) | 17.0 |
| Holland (1967) | 19.6 |
| United Kingdom (1968) | 20.2 |

According to more recent information (2) the English government accounts directly for 12% of the English market's EDP expenditures, and indirectly, i.e. through nationalized firms, education, medicine and science, for another 25%.
The Italian government accounts for 17% of the market and, if also transportation, communications and other public services are included, for 25%.

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(1) The sources are: for France, BIPE; for Germany, Institut für angewandte Reaktorphysik; for Italy, ISTAT; for Holland W.K. De Bruijn; for the United Kingdom, Computer Survey.

(2) I.ENSOR - "ICL and the case for computer collaboration" The Financial Times, April 27, 1970.

In France government, including nationalized forms, accounts for about half of all computer purchases and for more than 65% of the extra-large computer market.
In Germany, the diffusion of computers is greater in business, but government accounts still for 11% of the market. This change is probably due to the fact that only recently the governments of European countries have decided to support national computer industries by buying preferably from national manufacturers. The country in which this policy is used most is the United Kingdom, but also in Germany and France the effects of this policy are beginning to be felt.
Also concerning the use of extra-large computers in government, detailed data are available only for the United Kingdom. During the period 1962-1968 the total computer equipment in the subsectors of the English Public Administration has undergone the following changes:

| | 1962 | | 1968 | | ANNUAL RATE 1962-1968 | |
|---|---|---|---|---|---|---|
| | NUMBER | VALUE (billion $) | NUMBER | VALUE (billion $) | NUMBER | VALUE (billion $) |
| ARMED SERVICE | 11 | 1.4 | 210 | 8.0 | 63.5 | 33.8 |
| GOVERNMENT DEPARTMENTS | 25 | 1.5 | 123 | 10.2 | 30.4 | 38.9 |
| LOCAL GOVERNMENT | 21 | 1.0 | 219 | 15.4 | 47.8 | 57.2 |
| PUBLIC BODIES | 5 | 0.3 | 91 | 9.6 | 62.2 | 82.7 |

Thus, in 1962 Public Administration accounted for 18.6% of the total number of computers. Its relative importance reached 20.2% of this total in 1968. In general, government is an important user of large and extra-large computers. Germany and the United Kingdom, where it is possible to know the distribution per sizes of computers installed in government, present the following situation:

Percentage of the number of computers installed in government of the total, by size class (1967)

| | United Kingdom | Germany |
|---|---|---|
| Desk | 21.0 | 26,7 |
| Small | | 8.4 |
| Medium | 13.4 | 15.3 |
| Large | 24.2 | 28.0 |
| Extra-large | 9.8 | 35.7 |
| Total | 20.2 | 11.4 |

Through survey of large users it was possible to notice that the number of extra-large computers installed in government (including universities and service bureaus) is the following:

| | |
|---|---|
| France | 40 |
| Germany | 6 |
| Italy | 13 |
| Benelux | - |
| United Kingdom | 20 |

Data about the principal uses for which computers are employed in the Public Administration are available only for Italy (1). The machine/hours availability of Public Administration computers is distributed in percentage as follows:

| | |
|---|---|
| Accounting and Administration | 37.7% |
| Scientific uses | 24.6% |
| Statistical uses | 9.8% |
| Other | 27.9% |

(1) ISTAT - "Gli elaboratori elettronici in Italia al Marzo 1968".

## 3.2. In the Unites States

Periodically the computer installations in the US Federal government are surveyed by the Federal Inventory of Data Processing Equipment in the Federal Government, and their development between 1951 and 1969 can be summarized as follows:

| Year | Number of computers installed |
|---|---|
| 1951 | 3 |
| 1954 | 10 |
| 1956 | 90 |
| 1958 | 250 |
| 1960 | 531 |
| 1962 | 1,030 |
| 1964 | 1,862 |
| 1966 | 3,007 |
| 1968 | 4,232 |
| 1969 (June 30) | 4,620 |

All the installations in the Federal Government accounted only for 7.7% of the total number of installations in the country (in number).

The total EDP expenditure, including cost of hardware, software and personnel, amounted to 1,900 million dollars or 7.6% of the Federal budget.

In 1969, there were 215 models installed by 33 different manufacturers, thus causing considerable problems of compatibility among the computers installed in the various government agencies and calling for their standardization (1).

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(1) F.J.Cunnigham - The needs for ADP standards in the federal community, Datamation, February 1969.

The installations existing at the middle of 1968 were distributed among the various manufacturers with saies (by number) as indicated below:

| Manufacturer | Percentage of federal installations | Percentage of national total |
|---|---|---|
| Burroughs | 4.6 | 2.1 |
| CDC | 9.4 | 3.3 |
| DEC | 5.0 | 4.1 |
| GE | 1.7 | 2.8 |
| Honeywell | 5.8 | 4.3 |
| IBM | 28.4 | 61.8 |
| NCR | 5.9 | 6.8 |
| RCA | 4.2 | 2.0 |
| SDS | 4.4 | 1.6 |
| Univac | 21.3 | 8.6 |
| Other (23) | 4.8 | 2.6 |
| Special | 4.5 | - |
| Total | 100.0 | 100.0 |

Over 2/3 of the federal government computers are installed in the Department of Defense for civilian purposes, whereas the total number of computers used by this Department is far greater.

Among other important applications those of the Census Bureau can be pointed out, those for payment and reconciliation of government checks, those of the Social Security Administration, the Civil Aeronautics Board, the Internal Revenue Service and the Post Office Department.

When considering all government installations, comprising in addition to the Federal Government also State, County and City administrations, the percentage of government

installations rises to 9.84% of the total in 1969 (1). Although expenditures of state and local Administrations have together reached almost those of the Federal Government, diffusion of computers in these institutions is smaller. This is due to the different sizes of the Federal Government applications as compared to those of the local governments and to an overlapping of jurisdictions among local government agencies which prevent organic solutions of the problems. Thus computers are mainly used for the mechanization of basic record functions, and only applications for crime control are rather sophisticated.

The increase in the number of local government units (over 80,000 countries, municipalities, townships, social districts, school districts) creates considerable problems of coordination (2).

Despite considerable aid by the federal government to local governments through the vertical programs (which link together central, state and local governments for specific functions) coordination is not yet very effective.

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(1) "Computer in use, analyzed by standards" Computers and Automation, 1969.

(2) D.G. Price "Automation in State and Local Government" Datamation, March 1969.

## 4. Total Information System

### 4.1. Hypotheses of development

The expansion in the tasks governments perform today is reflected in the increasing size of the national budgets. These modifications in the state functions inevitably cause the criteria of choice and budget management to become more complex and warrant the introduction of new decisional techniques which require the use of extra-large computers. Management of public affairs, in the light of a "planning policy", requires continuous adaptation of government actions to reality which will not be possible without a mass of information made available at the moment in which it is necessary to revise or control a previous choice. This new policy and the greater complexity of the phenomena call not only for new technical requirements and new instruments, but presuppose an increasing state interference in the economic and social components active in the country.

Once a political-economic-social balance has been reached these intersectorial exchanges will be nothing else but exchanges of information which will be realized through complex systems of tele-processing using extra-large computers installed with those authorities in charge of management, planning and control of the State.

Exchange of this information will furnish the controlling authorities with the guiding elements for an evaluation of the choices made, and will have to take place at such a speed as to allow adaptation of government control activities to the changing external requirements.

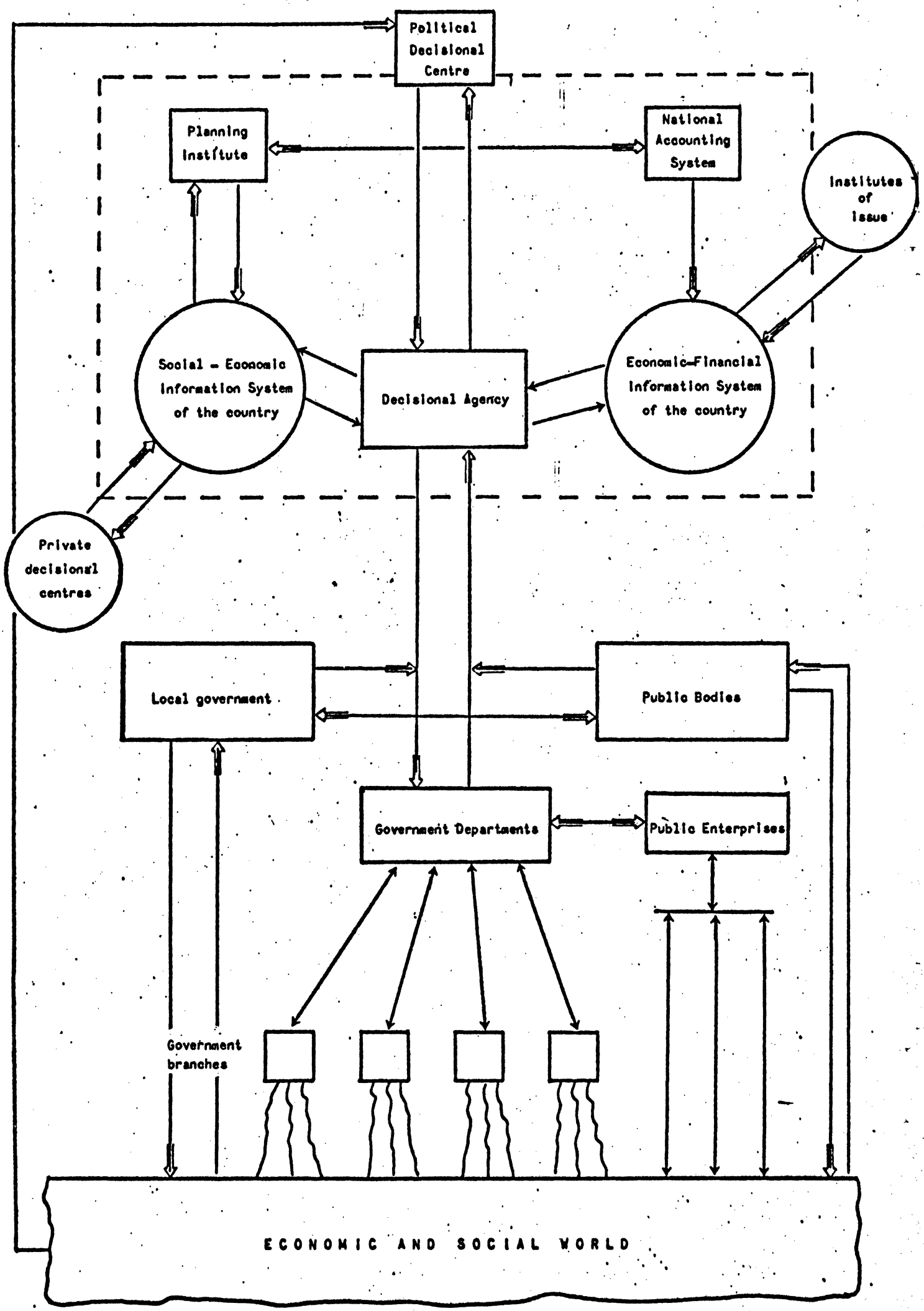
All the interrelations between the Public Administration and the public and private economic organization and the social reality of the country can simply be defined as the "total information system" of the nation as illustrated in fig.XI.1. Within such a system the moving force of the decisional authority becomes evident which, with the collaboration of the institutes for economic planning, has been charged by the executive branch with transferring into tactical terms the strategic policies in the economic and social field of the government (fig. XI.1 bis).
This authority will have to perform the following functions:

- outline tactical objectives of the program
- identify alternative measures for reaching these objectives
- judge and compare in terms of cost and effectiveness the alternatives emerging from the research

The various techniques which the decisional authority uses from the EDP point of view, require adaptation of recently introduced methodologies, such as the Planning Programming Budgeting System (PPBS) being used in the US since fiscal year 1966-1967.

# TOTAL INFORMATION SYSTEM





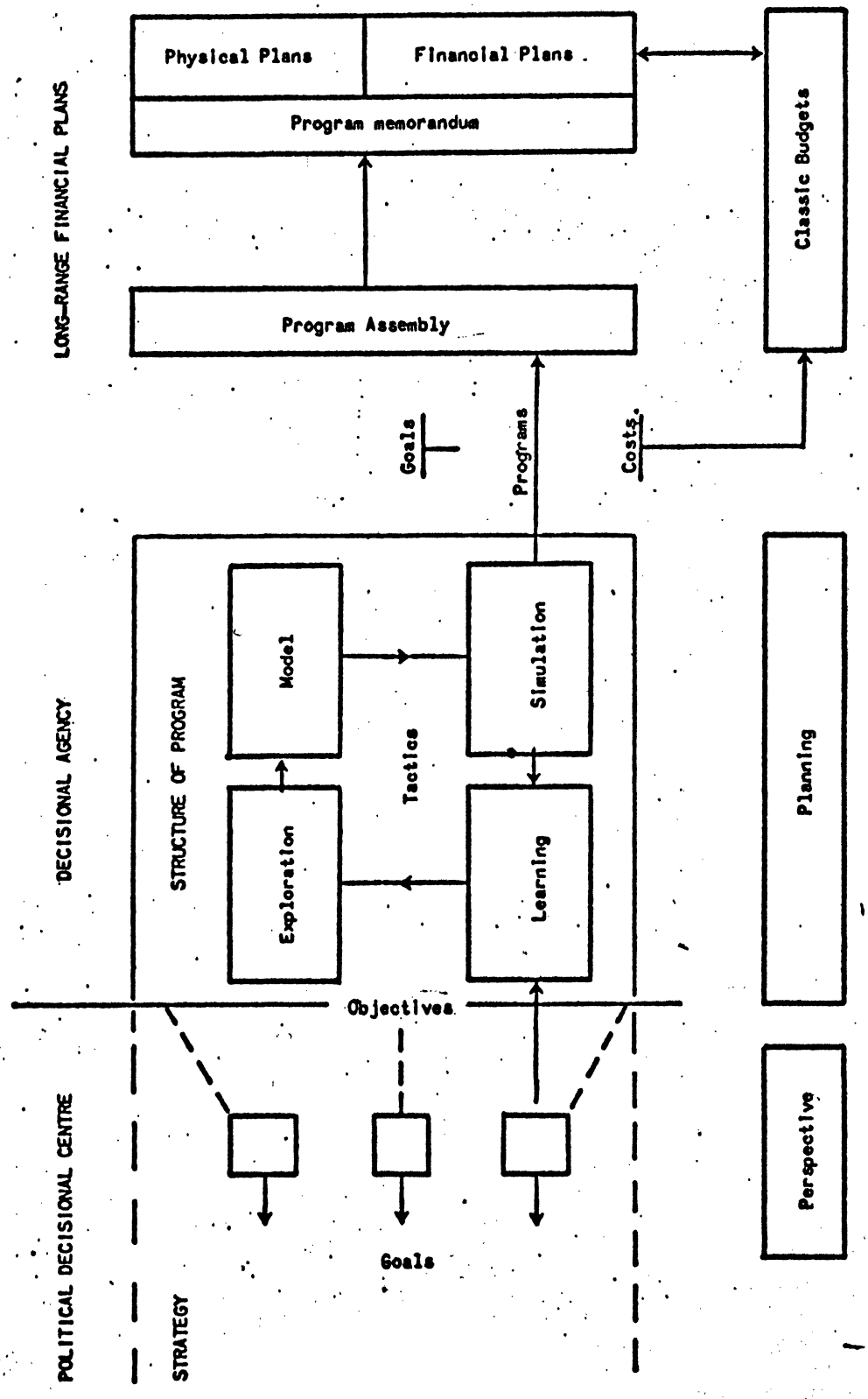

TOTAL INFORMATION SYSTEM: DECISIONAL AUTHORITY
LONG-RANGE FINANCIAL PLANS
Physical Plans
Financial Plans
Program memorandum
Classic Budgets
Program Assembly
Goals
Programs
Costs
DECISIONAL AGENCY
STRUCTURE OF PROGRAM
Model
Simulation
Tactics
Exploration
Learning
Planning
Objectives
POLITICAL DECISIONAL CENTRE
Perspective
Goals
STRATEGY

Fig. XI-1 bis

## 4.2. Prerequisites for the total information system

The total information system is obviously a long range object for the rationalization of government structures and the management of the State.

Its setting up is primarily a question of facing profound decentralization, not only in the sense of local instrumental autonomy, but also of decentralization of decisions.

The availability for local institutions of all necessary elements for a decision must not mean placing in the periphery all archives and files which, of course, would be duplicated in the central office. The periphery must begin surveys and the collection of information, there where they arise, but must not necessarily retain these data. Instead, continual and quick connections have to be insured with all the information in central archives which are necessary to make decisions.

Along with a serious decentralization arises the problem of training technicians in order to organize the integrated system.

Analysis and organization of the problems, especially those of the Public Administration which contain complex legal aspects, require years for the development in detail of all the interrelations which the total information system can organize.

Interviews conducted by us confirm that the first problems government has to face are basically of organizational nature and some can be solved only with the aid of strictly technical means. These problems concern:

1) input data : organization of data, coding, punching of large masses of information;

2) teletransmission : different sources of information distributed uniformly over all the national territory;

3) specialists : lack of specialists and necessity to convert and retrain government personnel.

Concerning the data to be processed it is thought that the solution lies in optical readers. Such peripheral units are already being used in experiments in some Dutch computer centres, but the results are not considered satisfactory at the moment.

The principal obstacle for their worldwide adoption lies in the necessity for standardization of the writing to be used.

Also the functioning of the reading units available at present is not perfect. Moreover, the cost of these units is very high and it influences to a great extent the value of the machines installed. As far as teletransmission of data is concerned, there arise two problems:

a) cost of terminals and lines

b) telecommunications.

This is an important problem when considering that the English government plans to have installed 200,000 terminals by 1980.

Exploiting telephone lines for data transmission seems to be the most widespread solution even if, at present, transmission speeds of 1200 bauds are not yet being surpassed.

The lines are not reliable and their cost is far from negligible. In order to avoid these inconveniences, the English government is thinking of using its own telecommunications lines for the satisfaction of all its needs.

In order to reduce cost to a minimum there is talk of using dispatching computers for networks requiring concentration of lines as well as for networks requiring concentration of messages.

Government is more favourably inclined toward the second type of solution because of its greater degree of liberty.

Expectations of the government sector are for extra-large computers, able to manage many peripheral units (the Belgian and Dutch interviewees request mass memories of 3/4 billion characters) and many terminal units, but must not necessarily include computers with high calculating speeds. The problem concerning specialist training leads to the following requests:

* management of multi-programming and multiprocessor hardware
* compilers as part of hardware
* special terminals for programmers for direct instructions to the system
* language and software for the control and management of computer systems operating in networks
* generalized language for the management of files.

## 4.3. Coordination Centre

The proposed total information system requires to couple along with the criterion of maximum analytic dispersion and joint responsibility of local authorities interested in the analysis that of direct presence and supervision of the highest executive powers, in order to give real efficiency to the analysts' tasks and to the organizational suggestions which derive automatically from a re-examination of the information flows.

There arises consequently the need for creating a Coordination Centre which organizes the Total System, the principal Subsystems and the detailed Projects. The same authority would have to establish criteria of priority among the subsystems and lend a helping hand in the coordination and assistance in the choice of equipment most suitable for data processing.

None of the countries examined in this study disposes at present of a centre which performs all these functions. Some attempts in this direction have already been made in Holland, for exaple, where the "Rijkskantoormachinecentrale" has been charged with the centralization of hardware purchases by all government agencies and it participates in the training of specialists which is carried out under the sponsorhip of the "Commission for Automation of the National Services".

The French "Délégation à l'Informatique" takes care of the promotion of EDP employment in government and offers consulting services in the purchases of hardware with the purpose of directing them toward the national production.

This is part of the "Plan Calcul" policies and more generally of the national planning.

Also within the English Ministry of Technology there exist authorities responsible for promoting and coordinating EDP applications in government: thus the "Computer Advisory Unit" has the task of consulting on all the projects of computer installations by government agencies. In Germany the Federal Ministry for Scientific Research has scheduled for the period 1967-1971 a program for the EDP field which comprises also the research for new possibilities of EDP applications in government by the "Gesellschaft für Mathematik und Datenverarbeitung mbH". In Italy there do not yet exist specific initiatives concerning EDP uses in Public Administration, even if all hardware purchases are coordinated by the Provveditoriato Generale alle Opere Pubbliche.

In the US the National Bureau of Standard has a data processing section which gives consulting services of organizational nature to the Federal Government and has the duty to standardize the organization of data and of EDP procedures without, however, having solved the numerous problems of coordination (1).

The organization of the coordination centre should follow these two phases:

a) individuation of subsystems and their EDP interrelations.

b) determination of priority of intervention in the subsystems.

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(1) See J.Cunnigham - "The needs of ADP standards in the Federal Community".

The technical plans defining the Projects should be outlined by the men working in each subsystem, with the help of methodologies, while the Coordination Centre would reserve itself the right of supervision over the entire activity. At any rate, priority would have to be given to information and control subsystems from whose efficiency depends effective functioning of the government planning system. Among the subsystems priority would have to be given to the State Budgeting and Central Propulation Register subsystems, the latter requiring introduction of a number for each citizen.

## 4.4. Integrated subsystems

Within the State "total information system" 10 subsystems have been singled out, and they should be carried out during the seventies:

1. State Budget
2. Taxation
3. Statistics
4. Central Population Register
5. Labour Force Register
6. Social Security
7. Public Health
8. Air Traffic Control
9. Meteorology
10. Law data bank.

The information system of the local governments has particular features because of the complexity of the functions they have to perform and the connections which would have to be established with the State's total information system.

In order to understand procedural details within each subsystem it is necessary to define its various projects and, within each project, the "Logical Segments".

The Logical Segments are the elementary units of the complex, those from which the actual work of translation of all standardized operations into the computer begins. Also for these elements it is necessary to assign execution priority and analyze possible interreactions.

It is obvious that it would be the task of the Coordination Centre to define the number and type of such units, as well as the times they employ to translate into data processing terms..

## 5. The Information Systems

### 5.1. State Budget

Within the hypothesized total information system the state budget system based on PPBS (Planning Programming Budgeting System) is the principal information subsystem.
PPBS let the government to come to systematic and programmed decisions about its expenditures in the light of a country's general goals. The budget choices are explained in function of the goals and different means of analysis are employed to evaluate the programs' degree of realization.
PPBS is a management system of the Public Administration which needs planning, programming and processing of the budget, as illustrated by the following scheme:

| Long Term | Medium Term | Annual |
|---|---|---|
| Planning<br>Strategy | Programming<br>Tactics | Budgeting<br>Expenditures Plan |
| Fixing goals programs' structure | Analysis and selection of programs | Processing of physical and financial plans |

a. Planning is the first phase of PPBS. It needs definition of long term goals relating to the needs to be satisfied and to the available financial means.

b. The second phase of PPBS is programming which is the connecting activity between long term planning and the annual budgets. The basic activity of this phase is systems analysis.
Systems analysis consists of the choice among different programs aiming all at the same objectives, in function of economic criteria which justify the better allocation of funds.
Furthermore, systems analysis requires a model of choices distinguishing between the analysis of a situation to be faced by the public administration at a given time and the choice of actions needed by the recognized situation. The model inputs are the national account data files and an archive of typical situations, and one containing behaviour rules. This model is illustrated in Fig. XI.2.

c. The budget per function groups expenditures in function of the goals which have to be attained and not for services. It implies a modification in the budgets' structure which moves from an allocative structure of government expenses to an aggregated one (Fig. XI.3).

FIG. XI.2. SCHEME OF THE FUNCTIONING OF THE MODEL OF ALTERNATIVE CHOICES

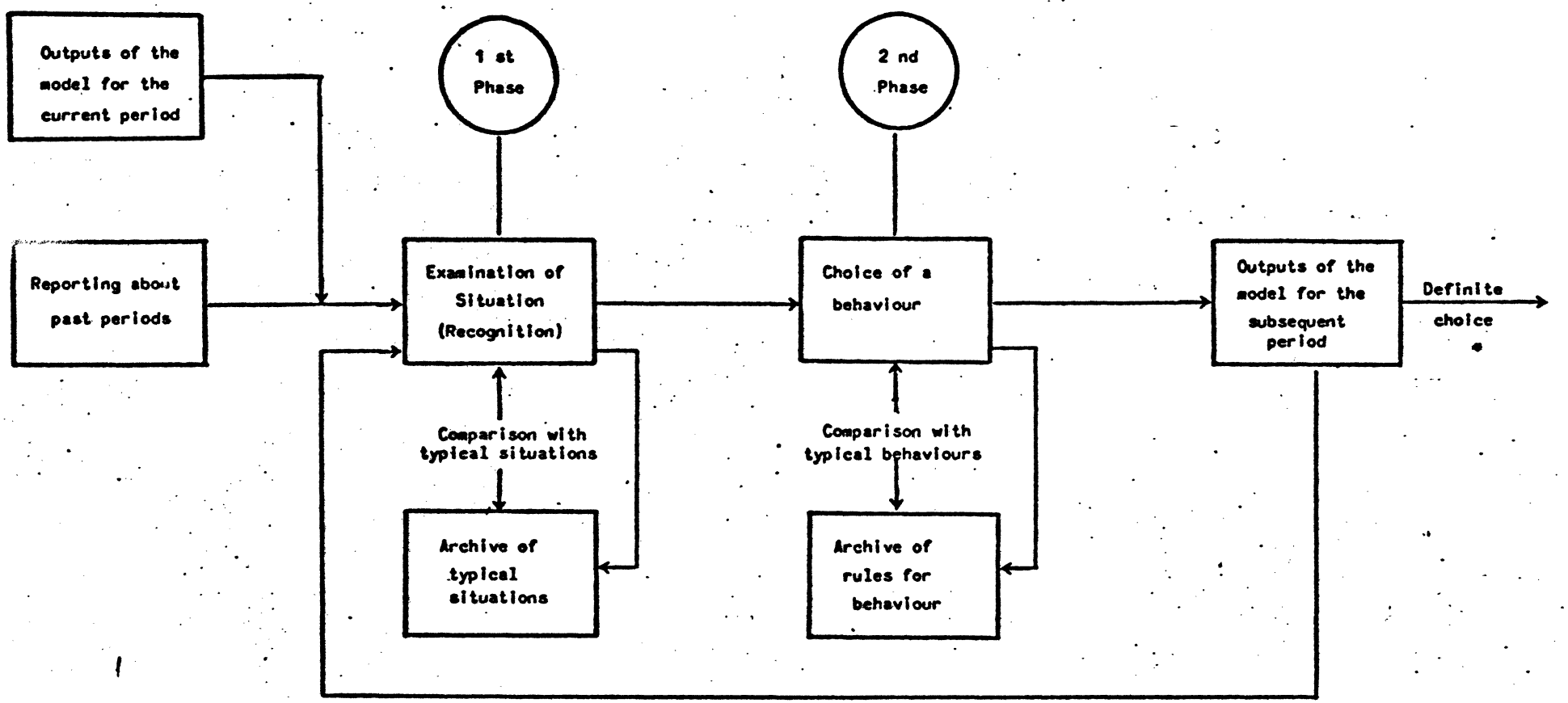
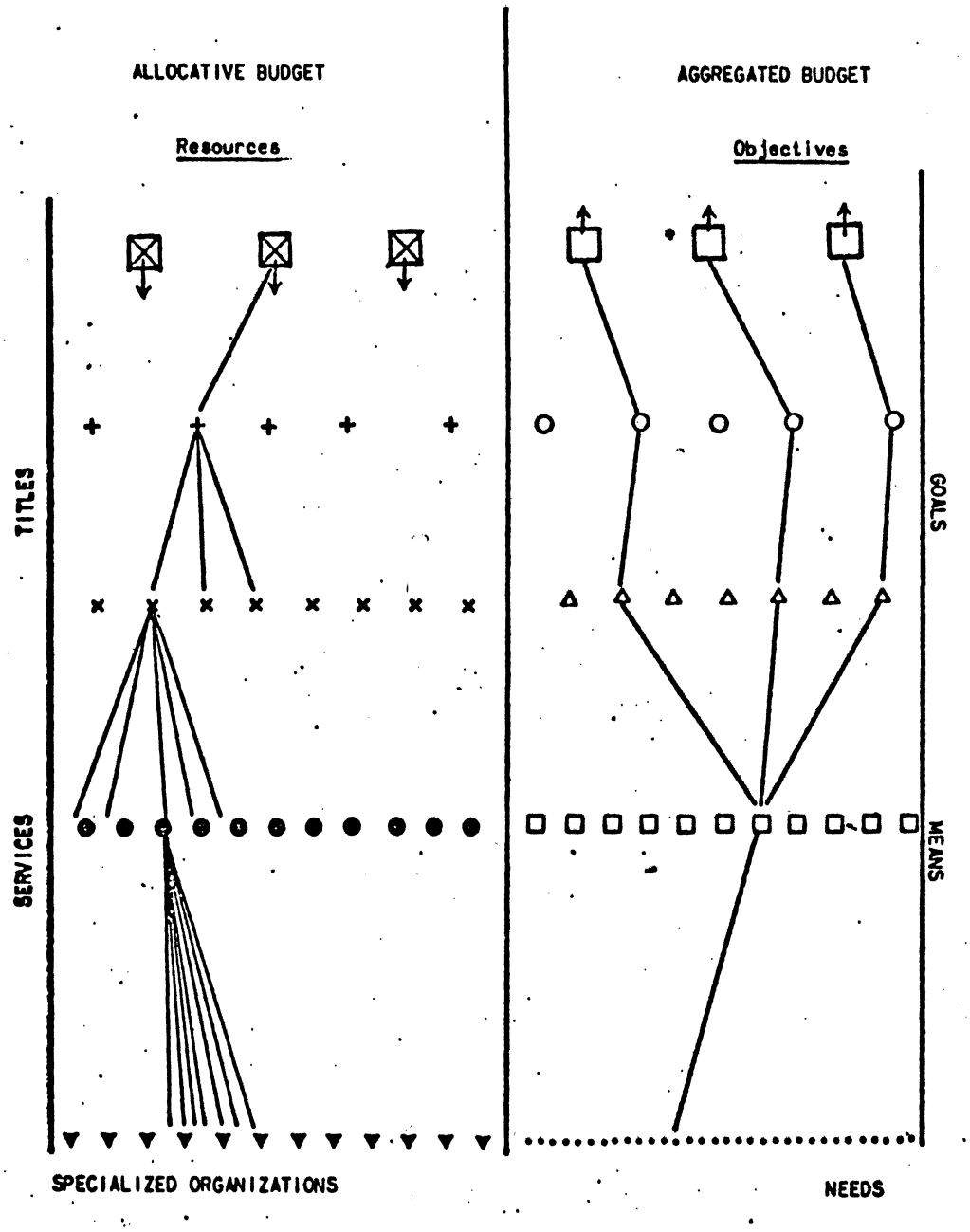


FIG. XI.3 BUDGET SCHEMES




SOURCE: PPBS J.C. BLUET: METRA VOL V.I N. 3 1968.

This method of choice rationalization is shown in the scheme: at each level concurring elements are associated and the expenditure flow is aggregated beginning with the smallest units.

The computer system needed for the government budget system, as it has been described above, will have a large central unit which is connected by terminals to the other subsystems and the decentralized agencies dealing with the state's accounting.

Budget information collected in the national centre and connected to the data concerning the national income will be the support of the economic and financial information system suggested.

At present the Planning Programming Budgeting System is being used extensively only in the US federal administration where, the system was extended to almost all federal agencies beginning July 1, 1968.

Almost all European countries move in this direction through the introduction of functional classifications of the budgets.

At present the treasuries are equipped with small or medium computers used only for accounting.

The direct survey shows that European governments are trying to integrate cash management and to update the cash reports. Similar efforts are being made in order to reduce the delay between the provisional and final budgets and in order to obtain the statistical and accounting information needed by the organs who approve the budget and control accounting. The increasing importance of government expenditures in the monetary flows (see table XI.2) forces the countries examined to make an effort toward integration of the government budget system and the issuing bank system in order to give to the latter information for evaluating the monetary situation when it is needed.

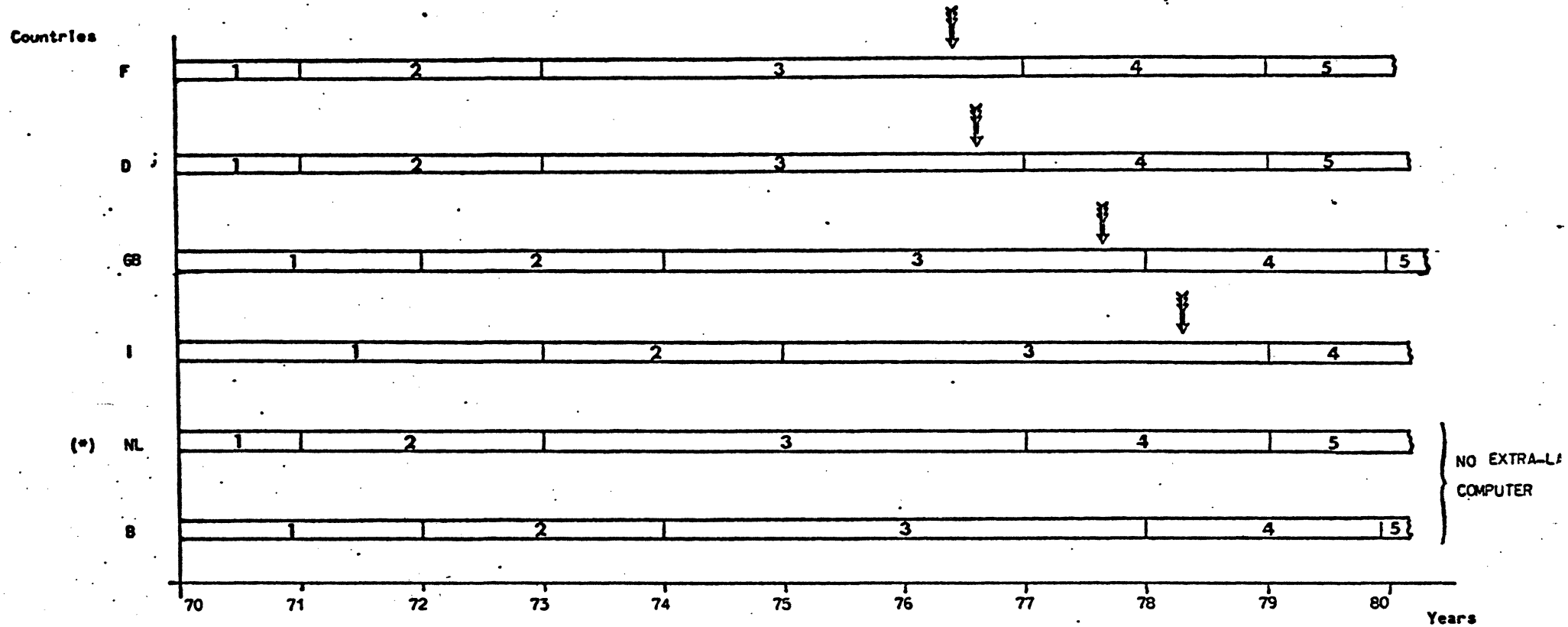
Due to these requirements it seems correct to assume that the budget information system will be completed in all the countries surveyed during the next decade (Fig. XI.4).

FIG. XI.2 TRANSACTION OF CENTRAL GOVERNMENTS IN THE EEC COUNTRIES (1968)

| | GERMANY | FRANCE | ITALY | HOLLAND | BELGIUM |
|---|---|---|---|---|---|
| PROPERTY INCOME | 885,0 | 548,8 | 952,6 | 267,9 | - 102,0 |
| INDIRECT TAXES | 13.820,0 | 15.880,6 | 8.766,2 | 2.682,3 | 2.670,0 |
| DIRECT COMPANY TAXES | 2.770,0 | 2.339,4 | 1.164,3 | 698,9 | 368,0 |
| DIRECT FAMILY TAXES | 10.917,5 | 5.196,5 | 2.984,5 | 2.627,1 | 1.460,0 |
| WELFARE CONTRIBUTIONS | - | 2.310,4 | - | - | - |
| OTHER TRANSFERS FROM FIRMS TO FAMILIES | 67,5 | | 200,0 | 30,4 | |
| TRANSFERS FROM OTHER GOVERNMENTS | 337,5 | 120,4 | 104,0 | 2,7 | |
| TRANSFERS FROM FOREIGN COUNTRIES | 232,5 | 187,9 | 28,7 | 74,6 | 8,0 |
| CURRENT RESOURCES | 29.030,0 | 26.584,0 | 14.200,3 | 6.383,9 | 4.404,0 |
| INTEREST OF GOVERNMENT DEBT | 815,0 | 1.267,6 | 1.070,1 | 350,8 | 506,0 |
| SUBVENTIONS | 1.455,0 | 3.292,6 | 1.158,6 | 154,7 | 304,0 |
| TRANSFERS TO FAMILIES | 3.060,0 | 4.319,0 | 996,0 | 323,2 | 328,0 |
| TRANSFERS TO OTHER GOVERNMENTS | 5.887,5 | 2.087,9 | 2.934,4 | 2.903,3 | 984,0 |
| TRANSFERS TO FOREIGN COUNTRIES | 1.002,5 | 1.078,4 | 149,4 | 91,2 | 102,0 |
| CONSUMPTIONS | 12.127,5 | 12.436,5 | 6.871,0 | 1.585,6 | 2.280,0 |
| (MILITARY) | (4.217,5) | (4.897,9) | (1.635,7) | (845,3) | (608,0) |
| CURRENT EXPENSES | 24.347,5 | 24.482,0 | 13.179,5 | 5.408,8 | 4.504,0 |
| SAVINGS | 4.682,5 | 2.102,0 | 1.020,8 | 975,1 | - 100,0 |

FIG. XI.4

SUBSYSTEM: STATE BUDGET




1 Integration Systems - Cash Management

2 Organizational Transformation for PPBS

3 Realization of PPBS (extra-large computer ↓)

4 Creation of State Budgeting Data Bank

5 Integration with Finance System

(*) In the state's electronic center an Extra-large computer can be justified if it is the same one a used for finance system

## 5.2. Taxation

The fiscal systems in the countries surveyed owing to history, laws and greatly differing institutions are so complex that introduction of information systems into this sector is a difficult task.

The trend toward simpler fiscal systems, which exists to a smaller or larger degree in all countries, has been hastened by the introduction of TVA in the EEC countries in the field of indirect taxes. This trend requires, however, new processing techniques, so that the simplification of the system from the theoretic point of view can be accompanied also by a simplification from the technical point of view.

EDP applications in the fiscal system, can differ because of institutional differences among the countries considered and be subject to modifications during the decade 1970-1980. We have examined only those which, being under study or realized by the maiority of the interviewees, appear to be, without doubt, subject to important developments in the seventies.

Automatisation of tax registers takes place for the purpose of direct income tax collection from physical and legal persons.

The automated system of tax registers would have a national center connected directly with all the tax collection districts where medium size computers are installed.

These district centers would have large core storage in order to manage:

- taxpayer's income statement files
- automatic calculation of taxes
- printing of tax forms
- management of tax collection.

The national center which would be equipped with an extra-large computer, could manage:

- national files of declarations concerning income and property
- a national file per taxpayer in order to check these national income tax statements which contain elements which cannot be checked directly in the regional tax districts. These are statements made by persons who are not residents of this district, referring to income from sources outside the district, omission of statement by persons not resident in the district, but who have income from sources located in that district;
- central management of cash flow.

A similar system is already in effect in the US where the Internal Revenue Service has to deal with 67 million individual tax returns each year.

In Holland the Ministry of Finance (1) has introduced computers only for the management of income tax, studying the register of all tax-payers.

---

(1) Which has one GE 415 and one GE (in addition to two Bull Gamma 10s).

In the United Kingdom the Board of Inland Revenue has already a center in East Kilbride, Scotland which is equipped with an ICL 1904 and a Bull GE Gamma 10 for collection and accounting of PAYE and NIGC contributions relating to 2 million taxpayers in Scotland.
Another center exists in Bootles, Lancs., which is equipped with two GE Gamma 10s for the collection and accounting of PAYE contributions.
The Board of Inland Revenue development program plans to have all Chief Inspector Branches equipped with computers by 1978 for the collection of PAYE contributions (1).
In Italy the project for the tax register foresees a general register with basic data in the National Center equipped with a couple of large computers and 9 smaller registers with much more detailed information in the 9 projected regional centers equipped with smaller computers.
It has been planned that during the current year all 667 district offices will have position files available and that by 1971 collection of information about the 12 million taxpayers will be completed.
Even if in all countries examined automation of tax collection is still under study, it can be forecast that this automation will be realized during the coming decade (fig.XI.5 ).
More difficult seems to be the realization, during the seventies, of integration, among the fiscal subsystems, of the connection of income tax collection boards with the other fiscal operating systems:

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(1) PAYE - Pay as you earn, income tax paid at the source.

- land register system
- indirect tax system

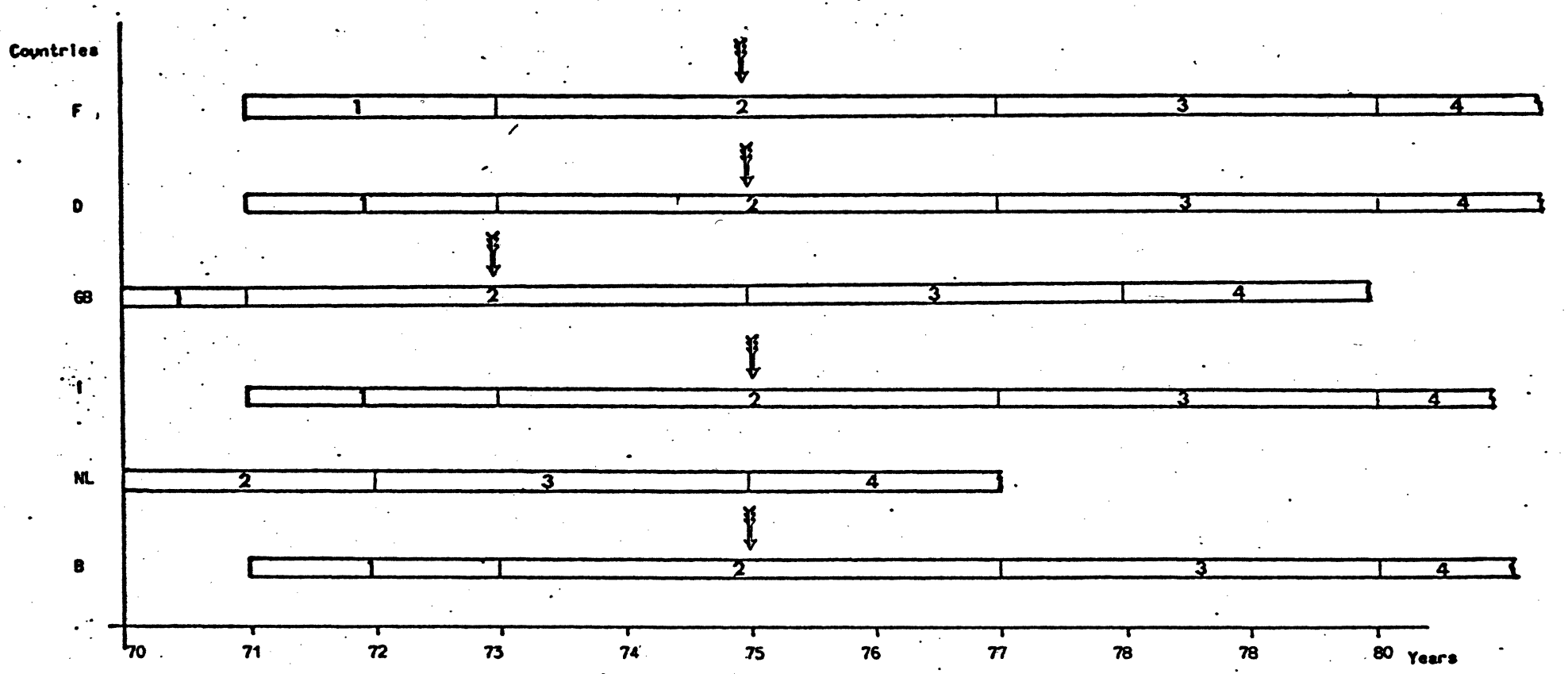
It is difficult to make hypotheses about the EDP developments in these two systems.

It can however be noticed that almost all the finance offices interviewed have begun mechanization of indirect taxes which are easier to ascertain and to collect and which are in some countries more important than the direct ones.

The applications concerning indirect taxes will be modified by the introduction of TVA, whose relative informational problems are being studied in Belgium.

Land register applications have thus far been developed only in Germany where they fall within the jurisdiction of local governments.

FIG. XI.5. SUBSYSTEM: TAX PAYERS' REGISTER




1. Study on tax payers' register organization
2. Setting up (extra large computer ↓)
3. Integration with other fiscal systems
4. Financial data bank

(*) See note in subsystem: accounting

N.B.- BECAUSE OF THE DATA MASS, EXTRA-LARGE COMPUTER INSTALLATIONS WILL BE REQUIRED BY THE FINANCIAL SUBSYSTEM, BEFORE THE SETTING UP OF THE TAX-PAYERS' REGISTER.

## 5.3. Statistics

The collecting and processing of socio-economic information which is actually being carried out by the Central Statistical Offices of the various countries, will assume a priority position in the hypothesized total information system. In fact, this office must collect information coming from other public agencies and it must then provide the government and private organizations with the necessary data. This subsystem would have to cover the following tasks:

1. Collection and processing center of statistical data with teleprocessing connections to the source of information. The setting-up of a similar system needs a standardization of basic information and a link-up with the peripheral surveying agencies.

2. Information service center for public and private organisations, which could be supplied with all economic-demographic data more quickly than before.

3. Data bank of the same information for the other government agencies which would have the possibility of automatic access.

Especially for budget planning (PPBS) the information has to be processed according to particular requirements of econometric-type models.
Obviously, the socio-economic data bank needs a computer with a high calculating capacity and a network of thousands of terminals.
There is to-day a high performance system at the US Census Bureau. Its Fosdic System is able not only to improve its statistics, but also to supply basic data to firms.
The current equipment of central statistical offices in the EEC countries is listed in the following table:

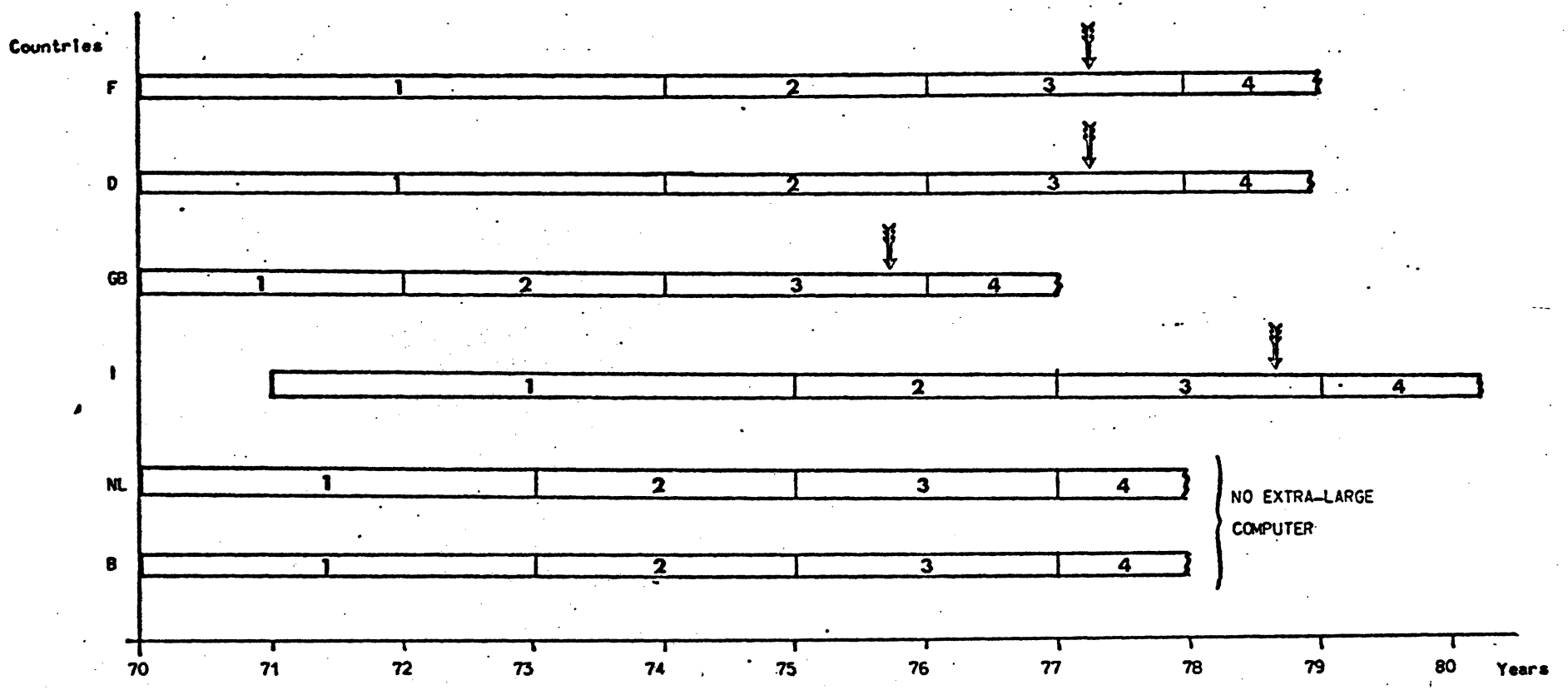
| COUNTRIES | ORGANIZATIONS | INSTALLATIONS |
|---|---|---|
| FRANCE | INSEE | 2 IBM 360/50/2 BULL GE GAMMA 10 |
| ITALY | ISTITUTO CENTRALE DI STATISTICA | 1 UNIVAC 1108 1 IBM 360/50 |
| NETHERLANDS | CENTRAAL BUREAU VOOR DE STATISTIK | 2 IBM 360/20 1 PHILIPS P 1400 |
| BELGIUM | INSTITUT NATIONAL DE LA STATISTIQUE | BULL GE 415 (S) 2 UNIVAC<br>BULL GE 425 (M) 1004 (S) |
| GERMANY | STATISTISCHES BUNDESAMT | - |

The central statistical offices of some European countries are turning toward higher performance systems and toward link-ups with the survey institutes.

Based on analyses it can be forecast that management/data bank interrogation phase (table XI.6), which is the one to justify the extra-large computer, will be realized in France, Germany, the U.K. and Italy between 1975 and 1980, and hence there will be four potential users of extra-large computers during this period.

FIG. IX.6

SUBSYSTEM: STATISTICS




1 Input data organization (terminal network - standardization)

2 Data bank setting up

3 Management/retrieval data bank (extra large computer ↓ )

4 Public Administration subsystems integration

## 5.4. Central Population Register

Projects concerning a central population register are under study in the countries examined. These projects encounter however normative and organizational difficulties, because of conflicts of jurisdiction among central and local authorities.
Such a central register requires before anything else that each citizen is assigned a code which will be most in most of the activities concerning the individual.
The basis for this project lies in the central file which collects all information about each subject and which is connected via terminals to all municipal registration offices and all other offices or organizations where there might exist information about physical or legal persons.
The central file would have to register all data concerning each person in a mass memory based on the individual number which has been assigned to each citizen.
The basic data, supplied by the local administrations, will be gradually brought up-to-date by the different sources of information, respecting thus the principle of centralization of basic information.
On the contrary this service would be inefficient.
The criteria described above should bring about a structure which has undeniable advantages which are all closely related to the fact that each operation of data acquisition would be executed only once and used several times, for the various tasks performed by different administrations.
The economy of the results would be coupled, in this case, with many social advantages, such as no duplicates of documents,

greater speed and precision of information, simpler procedures, no delays and direct and indirect expenses for the citizen.
In order to achieve a better organization, the hypothesized system would have to be connected to the other subsystems of the Total System such as tax registers, employment and social security offices.
A National Data Center, having the task of centralizing all personal information available at present in the various federal agencies, has been studied since 1961 in the US by the Bureau of the Budget and various committees (1).
But the congressional Subcommittee on the Invasion of Privacy (2) has pointed out the dangers to individual freedom which could result from such a Data Bank, calling at the same time for a limit on data collected therein and giving each citizen access to his personal file so that the risk of non-authorized access and abuse of the information would be reduced.
In the meantime improvements of the information systems in the various federal agencies are being studied without having to resort to the creation of the National Data Bank.
In the European countries the central population register is still subject of studies and discussions; in Belgium and Holland, as results from the direct survey, it is now under way.
In Belgium the national register will have a central file in which all details about each citizen are listed; for the setting-up of such a file one will have to resort to a magnetic registration system.

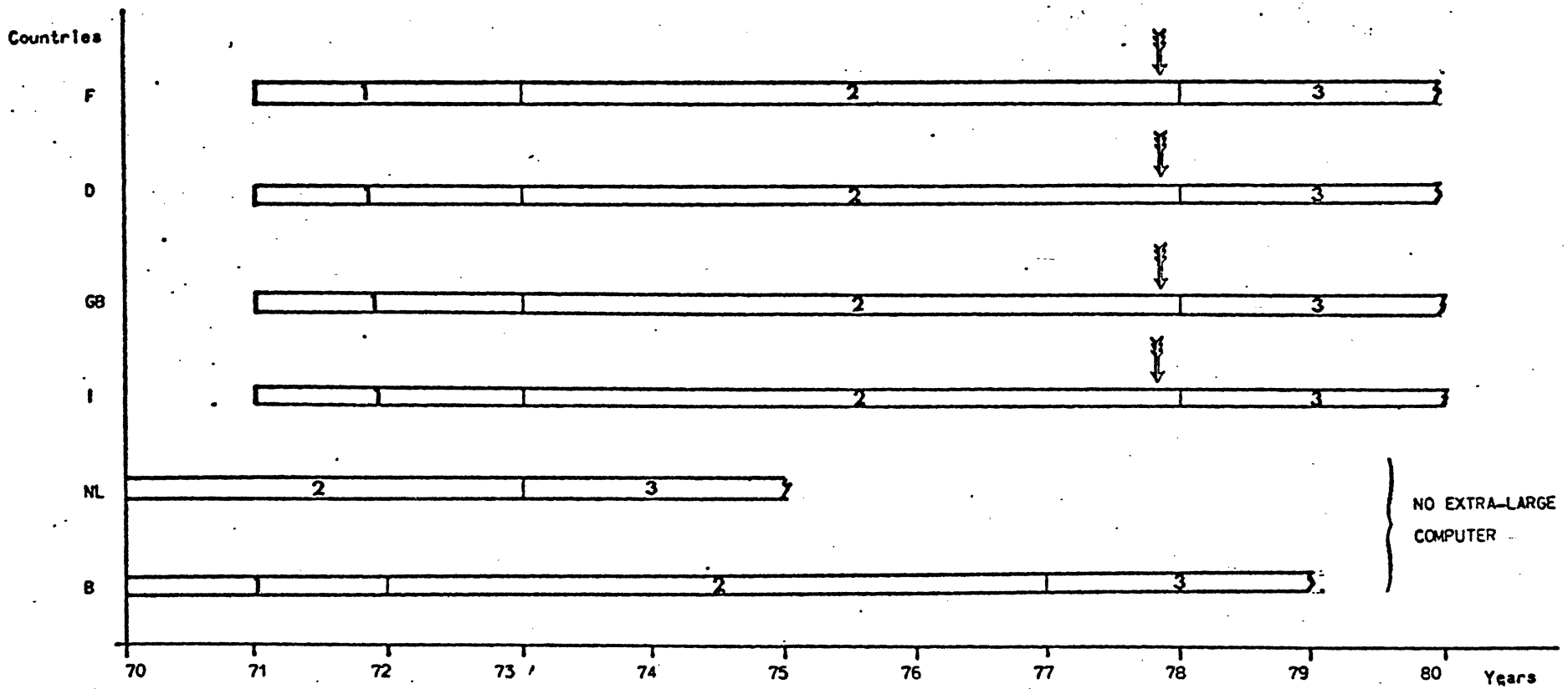
(1) Ruggles, Dunn, Kaysen.

(2) 35° Report by the Committee on Government operations, Privacy and the National Data Bank concept, US Government Printing Office, Washington, 1968.

In Holland the idea of assigning each citizen a number has already been carried out and the gathering of data about each citizen is performed by the Central Statistical Office. Since the central population register has to deal with a large number of data and has to be connected with the other Public Administration subsystems, we assume that, if realized, it will need a very large computer with large core storage. Considering that study and project will not require a long time it can be forecast that France, Germany, the United Kingdom and Italy will need this very large computer by about the end of the seventies. (Fig. XI.7)

FIG. XI.7

SUBSYSTEM: CENTRAL POPULATION REGISTER




1 Local bodies coordination - Coding

2 Setting up of population register data bank (Extra large computer )

3 Public Administration sub-systems integration

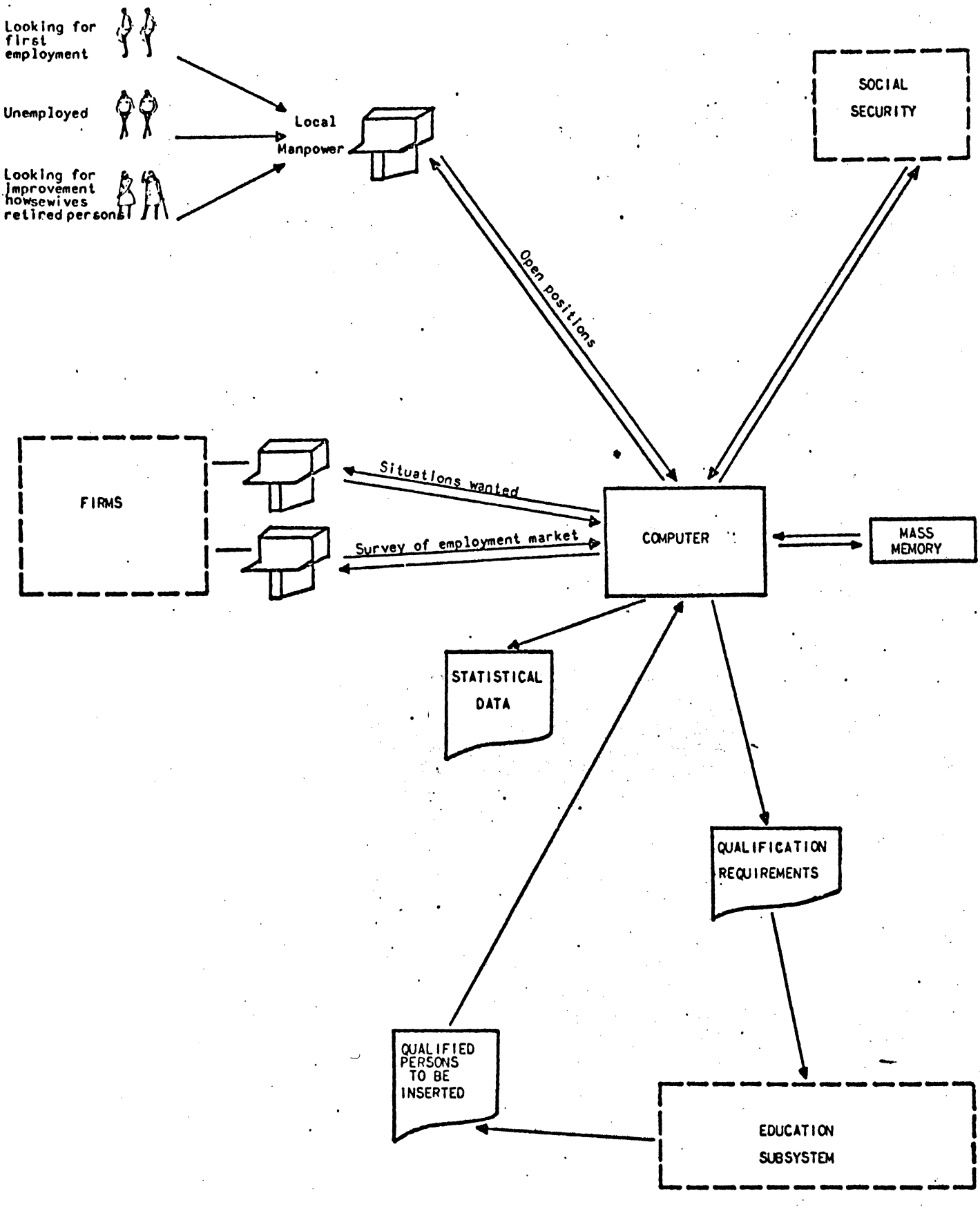
## 5.5. Labor force register

The labor force information system performs all the functions which have to do with the labor market and which are dispersed among various government agencies.
The most important observations the subsystem has to collect are:

- employment applications
- employment appointments
- young people coming into the labor force
- retirement of old and invalid people from the labor forces
- making employment contracts
- cancelling employment contracts
- immigration-emigration
- professional qualifications

Generally it can be said that there are two types of inputs: one concerning employment offers, the other concerning requests for employment.
On the one hand we have to create central records, which are brought up-to-date periodically, on: the labor force looking for first employment classified according to qualifications, age and sex; the temporarily unemployed persons classified per qualifications, age, sex, area and reason for the loss of the job; and the employed persons, classified per qualification, age, sex, and area.
On the other hand we have records which are brought up to date continually on the employment offers per area, industry, qualification, sex and age.

FIG. XI.8 LABOUR FORCES REGISTER



Comparison between data gathered in this way makes it possible to direct applicants quickly towards the proper job; to draw periodic reports about disequilibrium situations and their projections; to direct the activities of professional training of government and private institutions.

On a local level the public and private firms can ask, directly via terminal, the information centre about present and projected availability of qualified manpower for better definition of their own investment objectives, a better distribution of them over time, space and sector of activity.

On a national level the system can balance better local employment disequilibria, and plan new means of intervention within the national planning.

On a national level, the employment register could be further connected with the education sub-system in order to define programs for the manpower qualification which would correspond to the future demand and can be altered according to the technological development.

The employment register on a national level could pass to a second phase trying to achieve on a European level an integration of available information and a common management of the labor force.

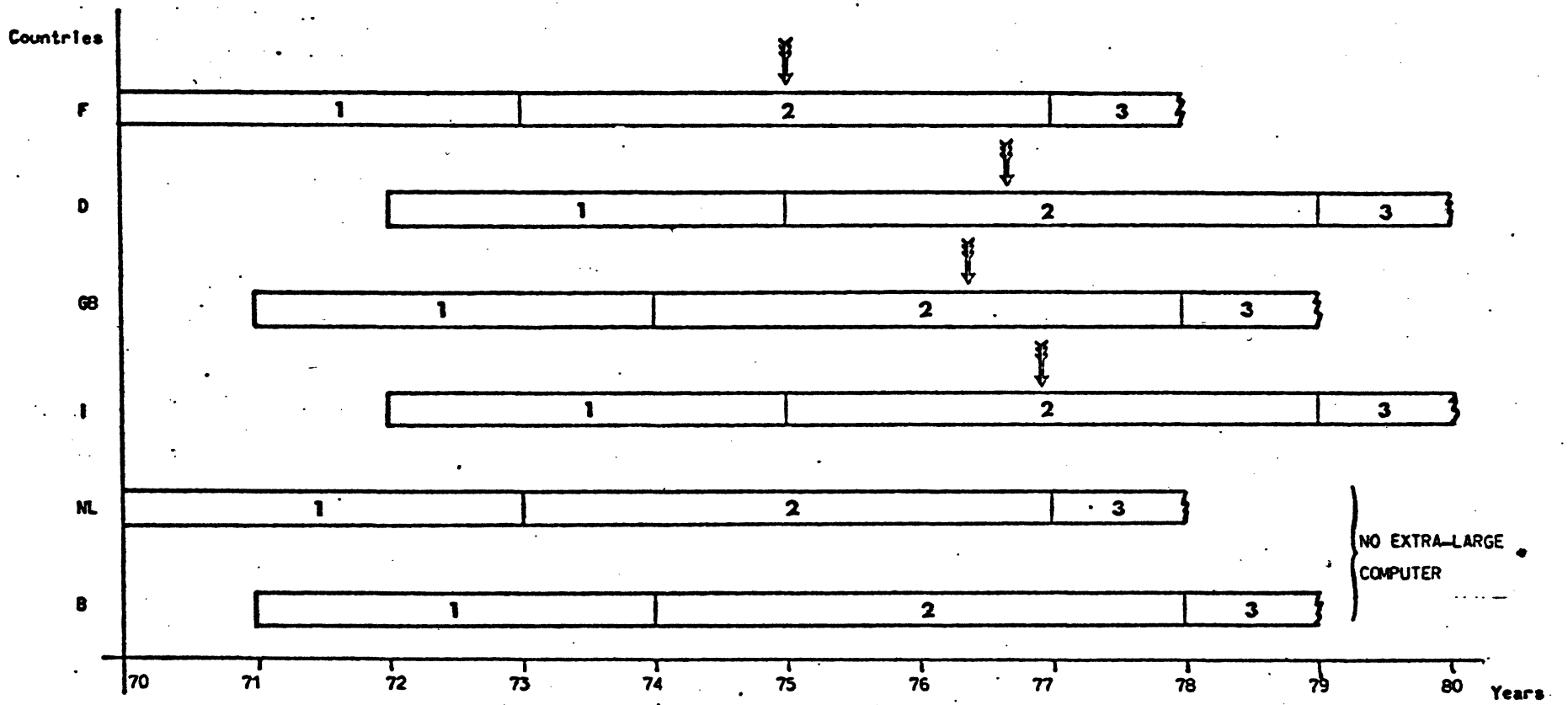
The problem of coordinating labor data is common to all European countries and not only to those having an excess of manpower, but also to those which are importers of manpower and call for a solution of temporary and regional disequilibria between labor supply and demand.

At present, statistics about open positions are maintained in Holland by the central EDP Centre and the installation of a data bank is projected.

In France the employment register is being studied; in Belgium a project concerning unemployed people is being studied at the Office National de l'Emploi.
In Italy a medium size computer is already being used by the employment offices, but the actual applications are still far from the employment of a data bank, because of the problem of placement is actually faced by peripheral agencies of the Ministry of Labor (provincial Labor Offices).
The increasing demand for more efficient employment agencies, which is connected to a greater professional and territorial mobility of the workers, requires from all countries profound changes in their present day placement services and these changes will require the introduction of extra-large computers by 1980 (fig. XI.9).

FIG. XI.9

SUBSYSTEM: LABOUR FORCE REGISTER




1 Creation of Data Bank

2 Management/Interrogation of Data Bank (Extra-large computer ⇓ )

3 Integration into general information system

## 5.6. Social Security

The increasing engagement of all European countries in the task of insuring people against the social risks (illness, old age, work accidents, family charges) through the social security system can be proved by the increase in national resources devoted to this purpose (table XI.3).

The various ways of financing social security (through contributions or taxation) and the differences among the organizations which perform these services in each of the countries considered make EDP development in this sector difficult.

The EDP development in social security requires, however, in every country a single agency which centralizes management and information, even if the various services offered are performed by different government, government-controlled or autonomous organizations. Only coordination, in fact, assures the social security system to reach the size which makes use of high performance computers convenient.

In social security EDP plays a very important rôle because it can guarantee automated control of the following phases:

a) collection of contributions from employees and employers
b) statistical data bank
c) security records
d) payments.

a) Social security revenue can come from:

- contributions from employees
- contributions from employers
- taxes and special revenues
- government contributions

Table XI.3 SOCIAL SECURITY RECEIPTS AND EXPENDITURES IN THE EEC COUNTRIES IN 1968

(Millions of $)

| | GERMANY | FRANCE | ITALY | HOLLAND | BELGIUM |
|---|---|---|---|---|---|
| PROPERTY INCOME | 735,0 | 196,7 | 303,5 | 47,0 | 130,0 |
| INDIRECT TAXES | 950,0 | 685,3 | - | - | - |
| COMPANIES DIRECT TAXES | - | - | - | - | - |
| INDIVIDUAL INCOME TAXES | - | 40,0 | - | - | - |
| SOCIAL CONTRIBUTIONS | 13.907,5 | 16.090,4 | 8.300,2 | 3.392,3 | 1.966,0 |
| OTHER TRANSFERS FROM FIRMS TO FAMILIES | 382,5 | - | 59,5 | - | - |
| TRANSFERS FROM OTHER GOVERNMENT ADMINISTRATIONS | 4.097,5 | 1.105,1 | 1.383,2 | 262,4 | 668,0 |
| TRANSFERS FROM FOREIGN COUNTRIES | 25,0 | - | - | - | - |
| CURRENT RECEIPTS | 20.097,5 | 18.117,5 | 10.046,4 | 3.701,7 | 2.764,0 |
| SUBVENTIONS | - | 0,8 | 19,8 | - | - |
| TRANSFERS TO FAMILIES | - | 28,4 | - | - | - |
| TRANSFERS TO OTHER GOVERNMENT AGENCIES | 14.952,5 | 16.562,0 | 8.964,2 | 3.339,8 | 2.530,0 |
| TRANSFERS TO FOREIGN COUNTRIES | - | 40,6 | 43,7 | - | - |
| CONSUMPTION EXPENDITURES | 112,5 | 140,2 | - | 16,6 | - |
| (MILITARY) | 5.312,5 | 803,5 | 700,3 | 127,1 | 164,0 |
| CURRENT EXPENDITURES | 20.377,5 | 17.575,5 | 9.728,0 | 3.483,5 | 2.694,0 |
| SAVINGS | -280,0 | 542,0 | 318,4 | 218,2 | 70,0 |

SOURCE: EEC/1969

Automatic collection of fees wich is being studied by interviewees PA6 and PA12 requires a system with a rather large number of terminals and central files for management of the fees; the great number of manual documents (in Italy 20 million a year) could thus be eliminated.

b) The statistical data bank should give information to the other subsystems of the state: central census bureau, employment register, tax collection system, state budgeting, public health system. The statistical data bank is far from being realized in the European countries, owing to the large number of organizations concerned with social security, notwithstanding the recommendations by the EEC commission.

c) The central files, which require to have a number for each citizen, would have to contain data about the contributors (in Italy 35 million for example).
It would give information about:
- each member's fees position brought up-to-date each month
- statement of payments for the various reason (old age, invalidity, unemployment, etc.).

d) For the lending of services the social security subsystem would have to join the banking network in order to make payments at the time when they are required and bring up-to-date the general security record at the same time.
The EDP applications seem to be easier to realize in those welfare payments which are periodic and thus better suited for mass processing (payment of old age pensions, allowances

for families, invalidity pensions etc.) than in those which are occasional (reimbursement of medicines and health assistance, allowances for maternity, work accidents, etc.). The current EDP applications are especially modern in the English Department of Health and Social Security, due to the fact that the English welfare system is the most efficient and the most centralized in all the countries considered. With a couple of System 4/70s in the centre in Newcastle-upon-Tyne 30 million security records will be computerized concerning pensions and family allowances which will affect 4 million families and 11 million children.

In the other European countries the variety of social security organizations makes EDP applications more difficult. Thus, for example, in France (1) where social security has 18 million people assisted and 3 and a half million beneficiaries of family allowances there are 355 specialized regional or departmental organizations (2).
Present EDP applications are concerned with the payments which call for 45% of time of the Paris centre equipped with a B 3500 and a CII 10070. In addition there are 30 centres equipped with 17 third generation computers.
Concentration into only one centre of all EDP activities of the Ministry for Social Affairs in France has, however, faced many difficulties.

(1) "O 1 Informatique", avril 1969.

(2) 16 caisses régionales vieillesse, 114 caisses d'allocations familiales, 121 caisses primaires d'assurance-maladies, 102 unions de recouvrements.

In Italy the social security system is split up into many organizations whose concentration has been called for time ago.

The most important one is INPS which takes care of pensions, with a budget of more than 6 million dollars and several computers (1), but its applications are not sophisticated. The central personal and health records have been scheduled for the seventies.

In Belgium the Caisse Generale d'Epargne et de Retraite, which is equipped with a 360/50, manages the Caisse de retraite (12% of its machine time) and the Caisse des pensions de guerre (4%). During 1970-1975 the system of retirement payments for sailors, civilians, miners, employees and workers should be reorganised.

The data collected shows that social security organizations are very interested in EDP applications.

They have to face many difficulties in planning their EDP systems because of institutional obstacles. It can be reasonably assumed, however, that these difficulties will be overcome during the next decade and that in almost all countries the Social Security Information System, even if not complete, will be achieved. (Fig. XI.10).

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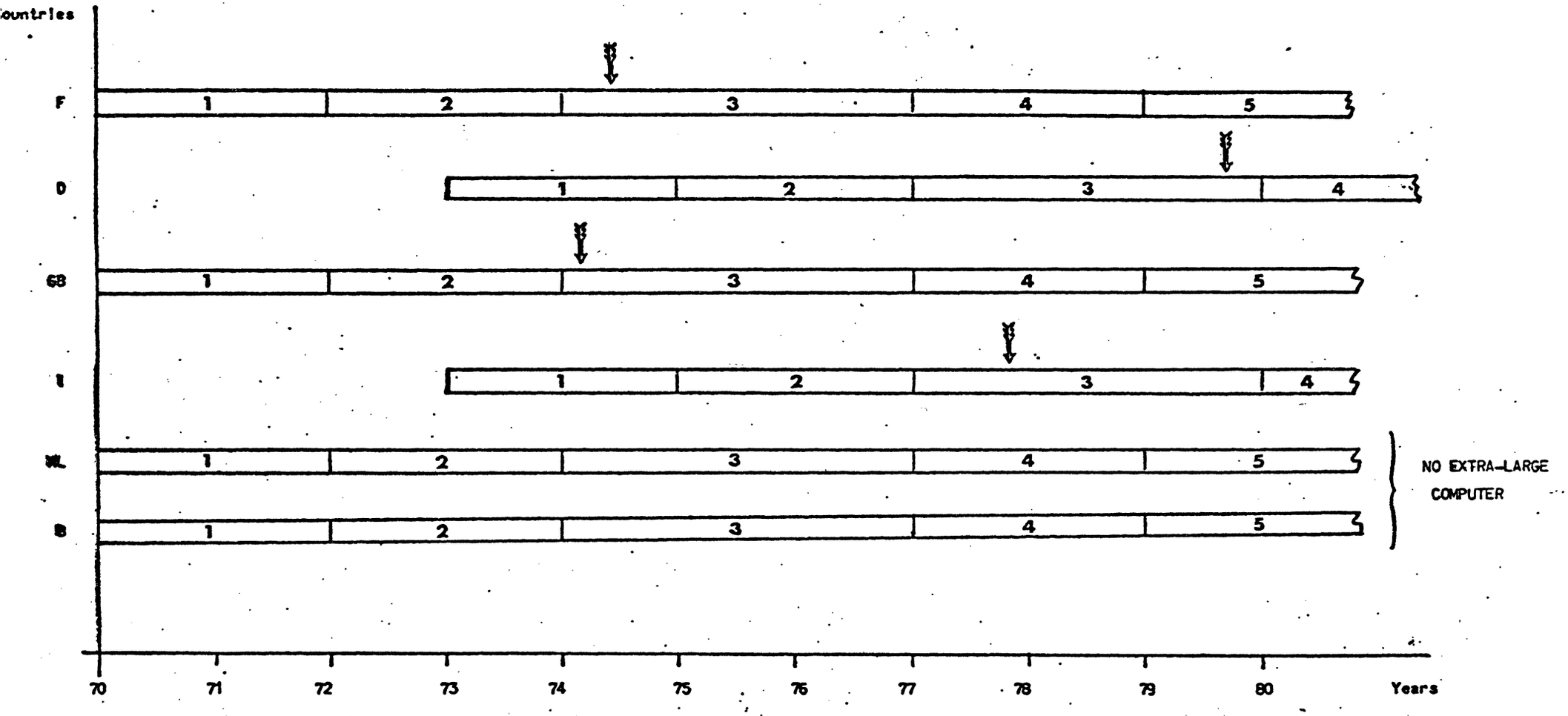
(1) The national centre and the provincial branches are equipped with 2 IBM 360/40s, 1 IBM 360/50, 2 GE 425s, 1 GE 415, 1 ELEA 9003, 1 UNIVAC 418.

FIG. XI. 10

SUBSYSTEM: SOCIAL SECURITY




1 Organisation of input data (Terminal network - standardisation)
2 Automatic collection of contributions
3 Payments of services: integration with existing systems (extra large computer)
4 Creation of security records
5 Management/interrogation security records
6 Creation of statistical data bank
7 Integration of Public Health Subsystem

## 5.7. Public Health

Public Health information systems are being studied and partly carried out in two countries not examined in this research: Sweden and the United States.
In Sweden the Karolinska Institute, the Danderyd Hospital and the Data Center for the Upsala area, coordinated by the "Institute for Planning and Rationalization" (SPRI) are studying EDP applications at the hospital, regional and national level. In the United States the most advanced applications are at the hospital management level but, according to some estimates, in 1970 computers will also be used in 70% of biomedical researches (1).
The electronic data processing in Public Health can take place at three different levels: local (hospital), regional and national. The main applications are the following:

- hospital management
- permanent clinical records
- basic medical research

The last two areas are only of governmental interest, but automation of hospital management which interests also private hospitals is by necessity prior to the other applications and the primary source of information.
In the hospital the computer performs administrative and scientific tasks, relieving thus the specialized and non-specialized staff of routine functions and abolishing multiple documents and transcriptions.

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(1) General Electric "La ricerca negli Istituti ospedalieri".

On the administrative level the computer can perform the following functions:

- checking-in patients
- management of available beds
- accounting
- wages
- supply management
- kitchen management
- pharmacy management
- diet control.

On the scientific level the computer can be used in:

- prescription control and administering medicines
- monitoring the patient (centralized patient control through results of blood pressure, electroencephalograms, electrocardiograms)
- reading and interpretation of X-rays
- management of files of laboratory analyses (1).

In a hospital centre real time processing is of vital importance: speed on both management and scientific levels is the first requisite of a computer in a hospital.
The processing, updating and filing of clinical records is very important for the whole public health system.
Obviously, the clinical records originate inthe hospital centre , but the hospital has no interest in keeping them.

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(1) In the United States, the Wodsworth Veterans Administration has achieved some good results in this field.

A patient does not always go to the same hospital and his clinical record might at different times interest different hospitals.
Since it is a social question and not a private one of the hospital, management of clinical records enters thus into the Government's jurisdiction.
Statistical information on course of illnesses, their symptoms etc. can all be obtained from clinical records.
The regional center would gather all data to be processed, through terminals installed by different organizations.
In Sweden the regional centers being studied would gather all the clinical records of a county in a data bank. Records would be brought up-to-date constantly by the hospitals and Public Health institutions, and would be available also to the doctors. Furthermore, this center would let know quickly the available bed space in hospitals of the area. It would also supply the national center with basic medical research data. The national center would have a data bank set up by experts which should increase the knowledge and the experience of the various centers which serve the whole population.
A nation-wide system, called MEDINET, has been studied in the United States, and is now experimented by 16 hospitals (1).
The national center would have to:
- spread over the country information about clinical experiences and primary and secondary effects of pharmaceuticals;

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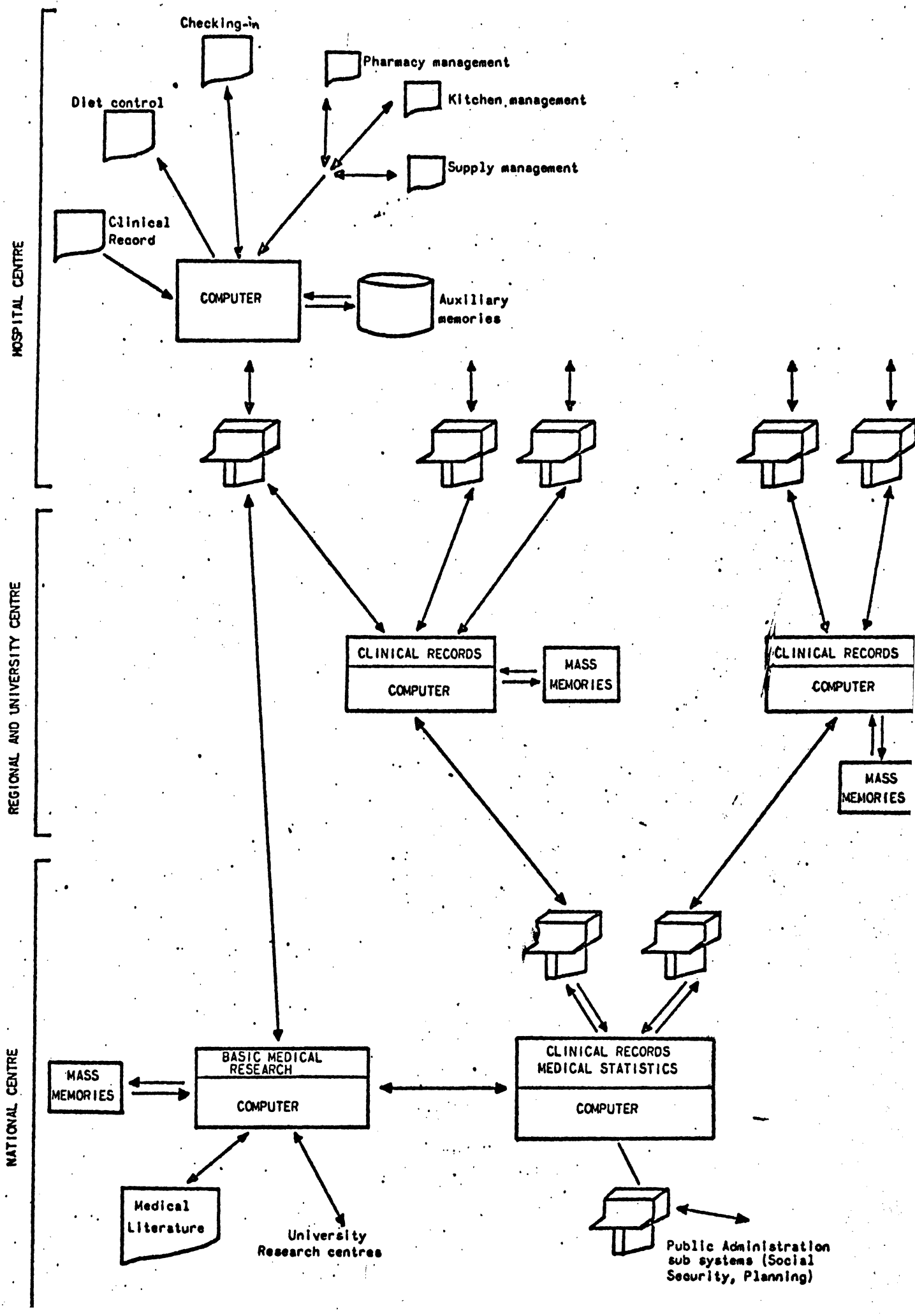
(1) General Electric: "La ricerca medica negli ospedali"

FIG.XI.11 PUBLIC HEALTH



- advise about infectuous and contagious diseases;
- update a health register of all citizens and a register of all doctors and their field of specialization.

The national medical research center would also have to make information retrieval on medical literature: Sweden is planning a data bank of medical records to which all interested European users should have access.
The national medical research center would also have to advise university research centers in teaching through models simulating the symptomatology of a disease (1).
Setting up such a complex system is a very difficult task in all countries, including Sweden: there are still other problems to face first, such as methodological, moral, economic and organizational choices (e.g. the assignment of a number to each citizen, which is required for the management of clinical records).

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(1) An experiment of this type was already conducted in Paris in 1963 in the faculty of medicine.

In the EEC countries and the United Kingdom the Health system is an urgent problem, but solutions encounter two obstacles: the lack of resources to be devoted to the studies about more advanced applications, and the lack of coordination centers similar to the Swedish SPRI. The various health functions are performed by hospitals subject to the most different legal rules concerning legitimacy and merit controls which vary according to the organs performing them and in the form in which they are carried out.

The data about computer equipment which we were able to find out for some of the countries examined and which are reported in Table XI.b in the annexes allow to state that:

- at present most of the computers installed in hospitals are small and only few are medium size;

- the most widespread applications are those of managerial type. In some hospital centers as the one of Villejuif in France, the University of Louvain in Belgium, the University center of Tübingen, Germany, and the King's College Hospital in England special types of applications are operating or being studied, for example monitoring of patients.

In France, the VI° Plan aims at the creation of a government health service; moreover, six public hospitals in Val d'Oise are now connected to a central computer. The English Ministry of Publich Health has scheduled the automation of 15 hospitals centers for the period 1970-1975.

In Italy a central file of special pharmaceuticals is

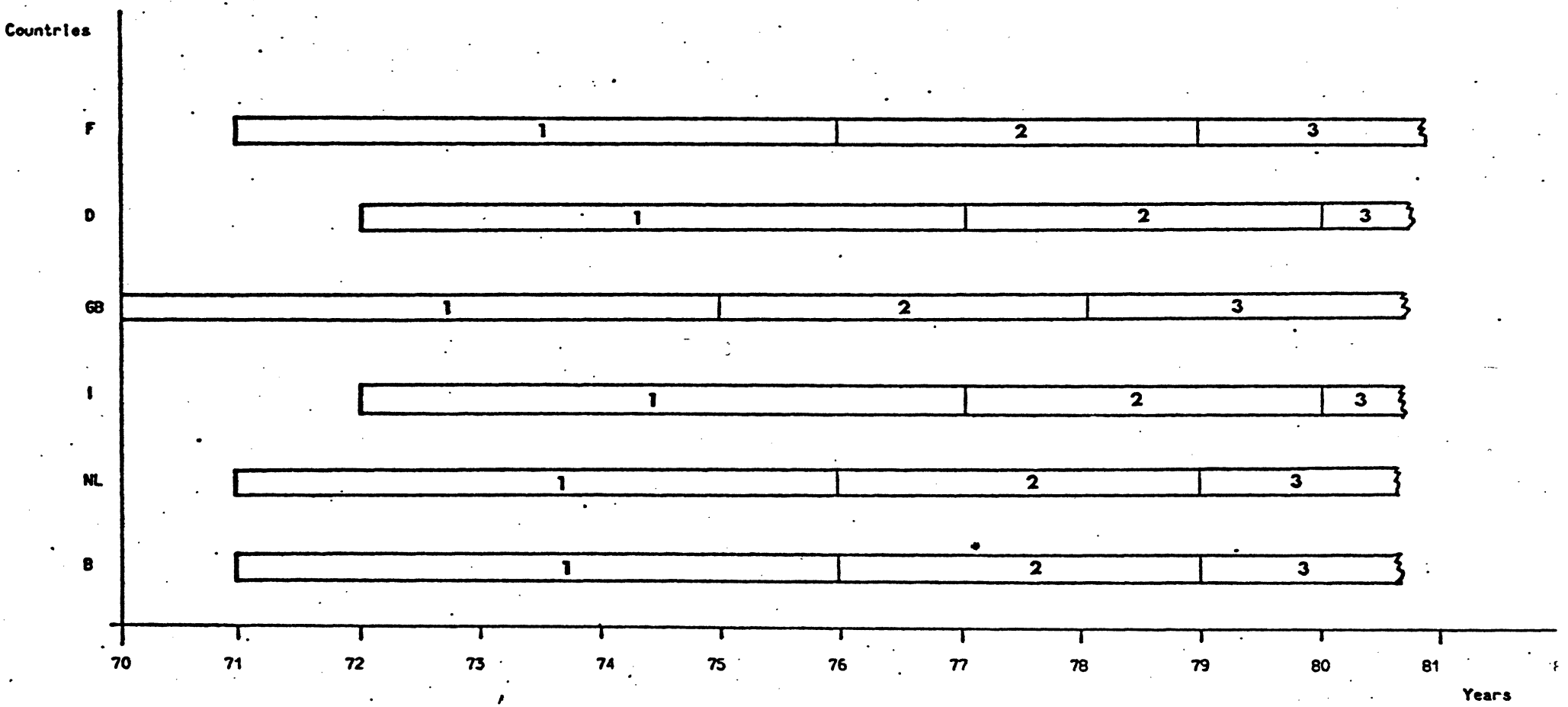
coming into existence, this application having been promoted by the Ministry of Health. The final goal pursued is immediate access to all basic information concerning registered pharmaceuticals or pharmaceuticals in process of registration in order to identify all those which are of interest to the public health.

In general, we agree with the judgement of interviewee PA3 who thinks the projects under way are very ambitious; but their realization is not foreseen in the near future, and budgets are still very insufficient.

Based on information about the present situation and the fact that investments in equipment for hospital information automation will be very high, it can be forecast that the Public Health sector will need a great number of extra-large computers, but they will not be installed during the seventies (table XI.12). Extra-large computers will be in fact required at the moment in which Data Banks will be integrated with hospital management.

FIG. XI.12

SUBSYSTEM: PUBLIC HEALTH




1 Information net with public healthbodies (normalization and standardization)

2 Institution of a data bank concerning public health

3 Integration with hospital management

4 Permanent clinical record

## 5.8. Air Traffic Control

Air traffic control should presumably take place on two different levels during the seventies:

- at the airport for the control of specific areas;
- on a national level for the control and coordination of all the air space of a country.

Air traffic control is a service which sees to it that air circulation runs smoothly and in an orderly manner, and which prevents collisions of aircraft and helps the pilots with navigation. A computer at airport level fulfils two different types of tasks:

a. it replaces operators on radio reception, control, handling and distribution of flight plans; it performs automatic transmission of information among the control sectors; it reports to the controllers about the traffic situation helping thus in flight planning; it registers automatically and reports to the operator position and altitude of the aircrafts with direct input from the radar survey;

b. it supplies the operator with results of logical and mathematical procedures of flight planning, preventing thus the mid-air collision threat.

The air traffic control system requires highly sophisticated equipment in order to achieve a real time operating system. This hypothetical system could also solve the task of airport management, that is to say, automate the various operations connected with each flight: checking-in of

passengers, cargo and mail, supplying food on board, distributing loads and balancing out the aircraft, printing of basic documents and sorting out messages concerning plane and passenger movements.
All documents concerning the flight could be teletransmitted to the airport of destination together with data about cargo and passengers.
The system could plan assignment of parking positions to the planes, plan maintenance times etc.
A scheme for a national air traffic control system has been prepared by the US Air Traffic Control Advisory Committee which recommends starting immediately with its realization in order to have it completed by 1995 (1).
The hypothesized National Airspace System requires:

- a scanning beam microwave instrument landing system for landing operations in the terminals;
- a higher capacity of the computers used;
- an upgraded ATC radar beacon system including an air to ground data link of variable sophistication depending on the type of aircraft;
- provisions for IPC (intermittent positive control) in congested traffic areas so as to reduce the mid-air collision threat;
- improved accuracy of vhf omnirange (VOR) and higher capacity

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(1) Electronics, October 27, 1969.

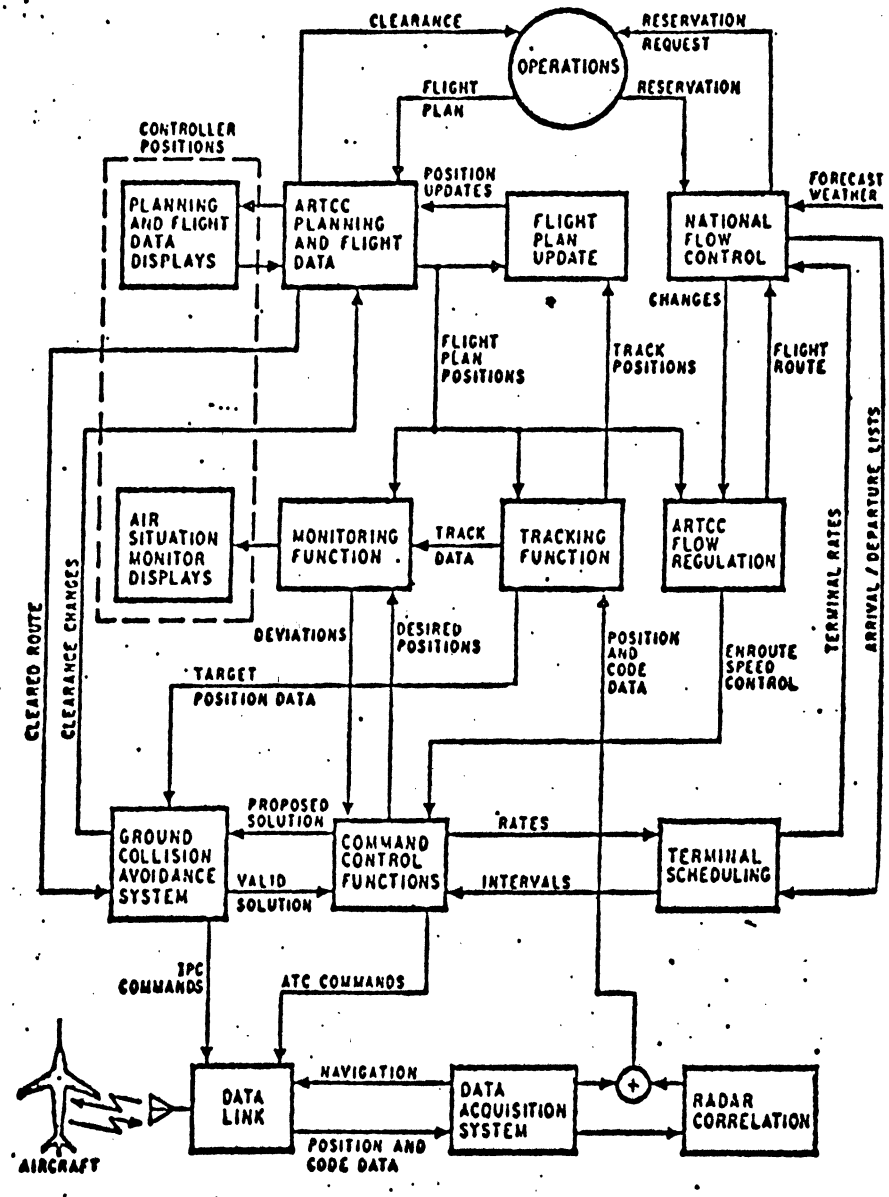
of distance measuring equipment (DME).

The Air Traffic Control radar beacon system which in the illustrated system is the principal source of information about position, altitude and identification of aircraft requires that all planes have automatic altitude encoders in their beacons. Data acquisition, accuracy and reliability have to be adequated to an automated ground system, and the beacons have to be used in en-route and in terminal situations for data acquisition, while an upgraded Vortc (vhf omnirange tactical air navigation) must be the primary navigation system.

The present on-board equipment and the computer performances however, have to be considerably improved in order to have a better accuracy in the determination of the aircraft's position in an airspace with high traffic density.

The system is illustrated in Fig. XI.13.

FIG.XI.13 How upgraded ATC system would work



In the countries considered air traffic control take place according to the rules established by the "Organisation européenne pour la sécurité de la navigation aérienne", which has projected the system "Eurocontrol". On this basis operate both the German and the Belgian central offices of traffic control.

In France the Direction de la Navigation Aérienne is, until now, only equipped with an CII 90/10,while in Italy the Ministry of Defence uses for air traffic control three IBM 360/40s.

Furthermore, the Italian Ministry of Defense has a project for air traffic control on a national level which will begin with automation of the control center for the Rome area and will later be extended to the whole country.

Owing to the continuous development of air traffic in the seventies all intercontinental airports will require extra-large computers (see table XI.5) to wich the various national networks will be linked. In smaller airports medium computers will be installed which can also process models of flight simulation.

TABLE XI.4 ENGLISH AIR TRAFFIC CONTROL

| | DESK+SMALL | N.C. | |
|---|---|---|---|
| BOARD OF TRADE, AIR TRAFFIC CONTROL EVALUATION UNIT PRESTWICK, SCOTLAND | - | FERRANTI APOLLO | Finding new solutions for handling air traffic volumes and evaluating use of computers for Air Traffic Control Systems |
| BOARD OF TRADE, AIR TRAFFIC CONTROL EVALUATION UNIT BOURNEMOUTH | ELLIOTT 502 | - | Investigation and evaluation of advanced concepts of ADP in air traffic control |
| BOARD OF TRADE, AIR TRAFFIC CONTROL EVALUATION UNIT BOURNEMOUTH (HURN) AIRPORT CHRISTCHURCH, HANTS | FERRANTI HERMES F 1600 | | Digital air traffic and radar simulator |
| BOARD OF TRADE, CIVIL AVIATION DEPT, CIVIL AVIATION COMMUNICATIONS CENTRE, CROYDON SURREY | ELLIOTT 4120 | - | Fully automatic message relay |
| BOARD OF TRADE SOUTHERN AIR TRAFFIC CONTROL CENTRE WEST DRAYTON (MIDDX) | FERRANTI HERMES | - | Air traffic control: flight progress strip production |
| BOARD OF TRADE, SOUTHERN AIR TRAFFIC CONTROL CENTRE WEST DRAYTON, MIDDX | 2.MARCONI ELLIOTT 920 | - | Flight plan processing system, control of aircraft data, traffic information; Standby local early warning and control (SLEWC) |
| BOARD OF TRADE, SOUTHERN AIR TRAFFIC CONTROL CENTRE WEST DRAYTON, MIDDX | (PLESSEY X L) | - | Air traffic control |
| BOARD OF TRADE, SOUTHERN AIR TRAFFIC CONTROL CENTRE WEST DRAYTON, MIDDX | ICL 3. MIRIAD I | - | Flight plan processing system, control of aircraft, data traffic information |

SOURCE: COMPUTER SURVEY 1969.

Table XI.5 European Intercontinental Airports

(Forecast of passenger traffic in millions of units in 1985)

| Airports | 1985 |
|---|---|
| London | 100 |
| Paris | 50 |
| Frankfurt | 50 |
| Rome | 34 |
| Berlin | 25 |
| Amsterdam | 25 |
| Hamburg | 20 |
| Milan | 18 |
| Glasgow | 12,5 |
| Düsseldorf | 9 |
| Manchester | 12 |
| Brussels | 10 |
| Munich | 11 |

SOURCE: "Avant et après Concorde" di F. SEMI-S. BANKIR-1968

## 5.9. Meteorology

Metereological research deals with a vast range of observations of the high atmosphere and surfaces (ocean and continental). Observations are carried out by continental stations, ships in the ocean, weather balloons, radar and, in the high atmosphere, satellites, and require sophisticated systems of data acquisitions, transmission and processing.

In metereological institutes the large computer is used for the collection of all information needed to set up a model of the atmosphere's structure and must therefore have a high storage capacity.

The model is dynamic and constantly altered depending on the information coming from the various observation points.

Often information is supplied in the form of weather maps and requires consequently that the system is equipped with scanners which transfer quickly the information to the model on the computer.

At given moments the program calls for the extraction from the model of the most important features of the weather pattern which are then supplied to other information subsystems, mainly the air traffic control.

The program can also be used for weather forecasting which is more accurate the greater the number of information supplied to the model is. Both the information feeding-in process and the extraction of the programs for the weather report and the weather forecast for limited areas require great calculating capacity from the extra-large computer.

On the subject of peripheral hardware there exist some technical problems of interface, long distance terminals and sensors.
The graphic systems (display, plotter, light pen) are surely the most suitable ones,because graphic form is most natural to the metereologist's activity.
At present, in all European countries the meteorogical service is performed by the central government, and the relative importance of the various metereological services can be deduced from the following table:

NUMBER OF OBSERVATION STATIONS BY COUNTRY

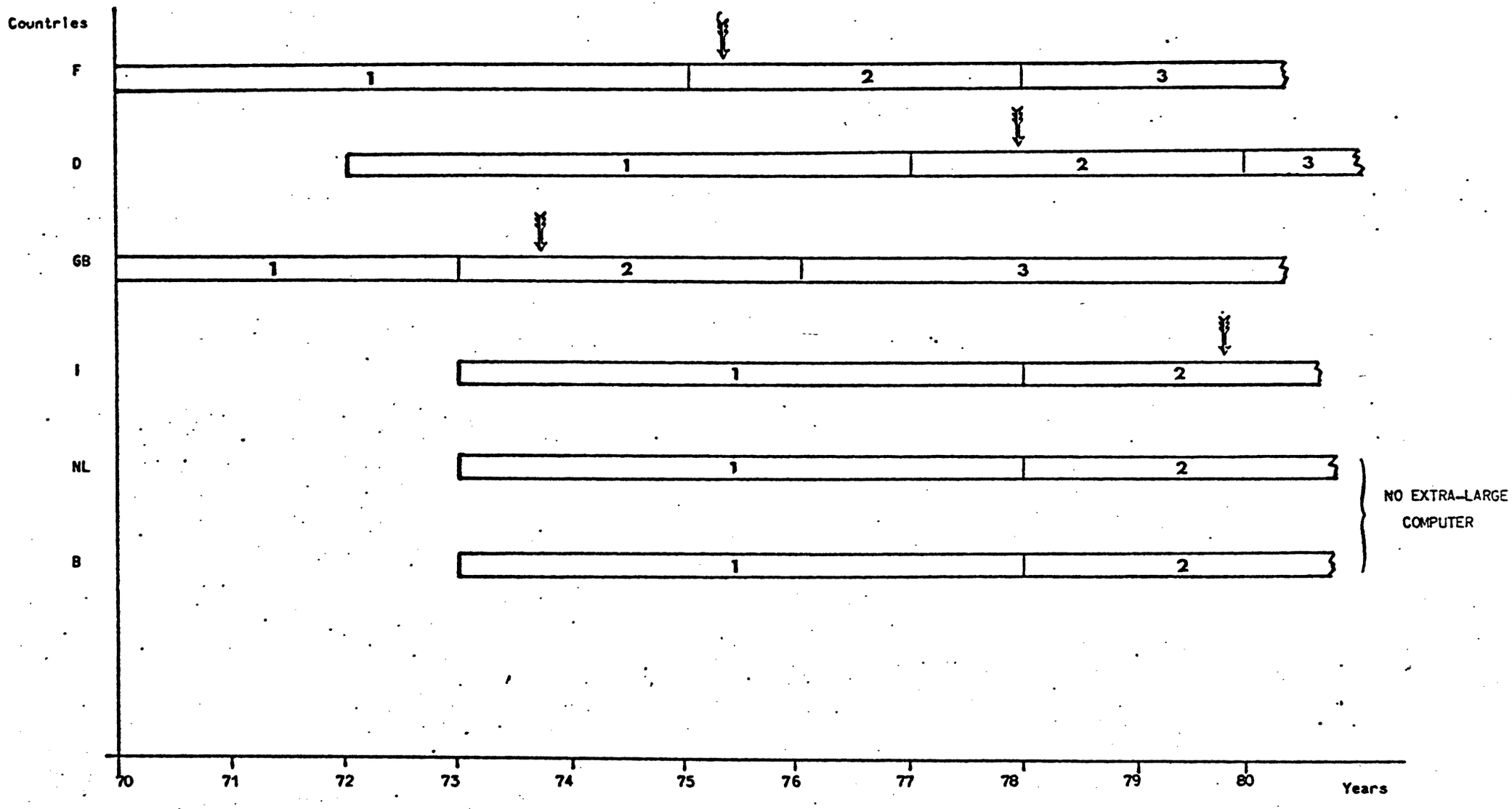
| COUNTRIES | TOTAL | STATION | UPPER AIR STATION | AREA (000 SQUARE MILES) |
|---|---|---|---|---|
| BELGIUM-LUXEMBOURG | 11 | 8 | 0 | 13 |
| FRANCE | 160 | 110 | 6 | 213 |
| GERMANY | 218 | 69 | 10 | 137 |
| ITALY | 146 | 49 | 5 | 116 |
| UNITED KINGDOM | 267 | 81 | 9 | 94 |
| US (Including ALaska) | 429 | 223 | 93 | 3,609 |

SOURCE: WORLD METEREOLOGICAL ORGANISATION.

It can be noticed that in Europe the observation stations network has a greater density per surface than the U.S.
The computers actually installed in national meteorological institutes and in the principal observatories already belong to the class of large or extra-large computers.

FIG. XI.14

SUBSYSTEM: METEOROLOGY




1 Creation of information system

2 Setting-up (extra-large computer )

3 Management

In France the "Direction de la Meteorologie nationale" has a CDC 6400 (in addition to a Bull/GE 30); the Paris observatory two IBM 360/65s (in addition to one IBM 1401 and one IBM 650) and an observatory in Nice has an IBM 360/50.
In the UK the Meteorogical Office has at present one ICL KDF 9 for weather forecasts and climatic data processing; by 1970 the system will be completed with three Myriad IIs and also one IBM 360/195 has already been ordered.
Around 1975 this system will be integrated with analogous systems operating in America, Asia and Australia to control the atmosphere's conditions in the entire Northern hemisphere. When all the information coming from continental and marine observation points, from satellites and teletransmission systems of other contries will arrive at the IBM 360/195, the English system will be integrated into a very large communication network.
The use of computers in meteorology will probably see a considerable increase with the realization of the World Weather Watch project, set-up by the World Meteorological Organization in collaboration with 130 national weather services and which should lead to automatic processing of meteorological data on a world-wide basis by the mid-seventies.
It can thus be forecast that in the EEC countries as well as in the UK the national meterological services will be equipped with extra-large systems by the period 1975-1980 (fig. XI.14).

## 5.10. Law Data bank

The law offices main problem consists of the great amount of data which have to be dealt with and their continuous upgrading (1) Consequences of this state of affairs are slowness and high costs of the judicial system in all European countries, internal contradictions among sentences referring to the same fact, etc.

To solve this problem the French "Group for studying EDP applications in the legal professions" has proposed a national bureau of legal information and resorting to their automation as "the only means which permits to cope with the volume of judicial matters which have to be dealt with, with the need for speed and precision of the answers and with the possibility of interrogation from a distance". "The problems of setting up such an information center should not be particularly complex as the juridical reasoning is basically logical and calls, like mathematical reasoning, for notions of aggregation, membership, equivalence, implication and application" (2).

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(1) We are quoting data valid for France in 1969:
"To the five fundamental codes which are frequently modified, the published laws are added which each year amount to 12,000 pages of the official newspaper for a total of about 1,300 laws and 5,000 circulars or legislative orders. To these have to be added the sentences issued by the Courts (2,500,000 suits a year) and articles and books dealing with law and commenting it (130 books a year and more than 20,000 articles)" (Informatique No. 2, 1970).

(2) Informatique No. 2, 1970.

The judicial information centre should be connected directly to all the sources of the law and have the following structure:

- national for the collection, processing and storing of all existing judicial information.
- regional for data collection and to make its utilization easier to people concerned with Law.

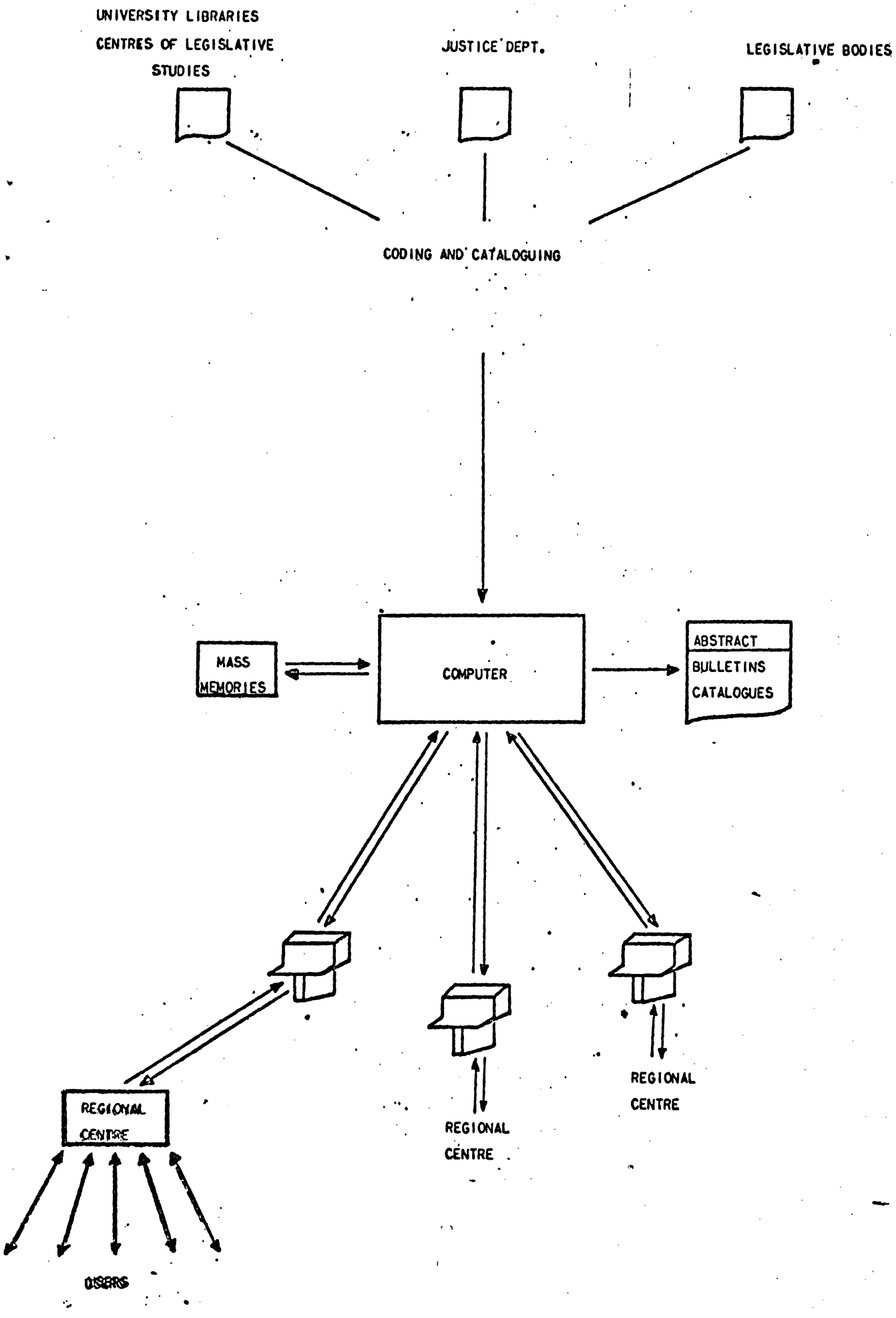
The French group proposes that some of these regional centres form data banks for special branches of the law.
For France this proposal would look like this:

- Centre of Lille: commercial law
- Centre of Clermont-Ferrand (where the national school of financial sciences has its headquarters): tax law
- Centre of Toulouse: aeronautics and space law
- Centre of Paris: international treaties.

All information would be collected by the regional centres which, before sending it to the national centre will carry out the initial processing and coding of information.
The regional centre connected with the national centre have the task to give a form to the questioning of the users, in order to obtain the most consistent answer possible. This problem is of extreme importance when the system permits to perform researches based not only on the literal meaning of the words used in the questions and in the text of the document to look for, but also based on the affinity of the concepts, even if expressed with completely different words.

FIG.XI.15

LAW DATA BANK



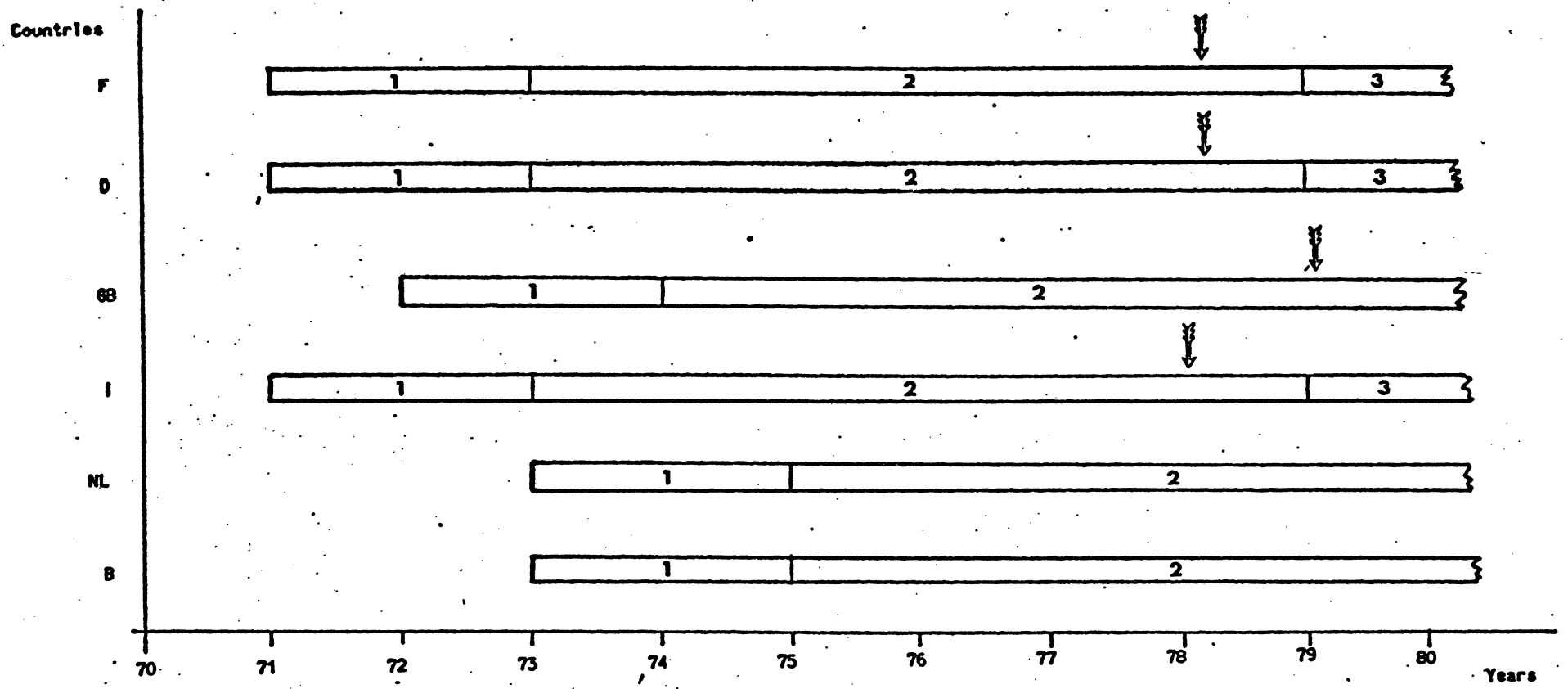
At present, studies about legislative documentation are under way in practically all countries examined in this research. In particular:

- in Italy the "Massimario delle sentenze" has been initiated by the Corte di Cassazione which, with a UNIVAC 1108, permits finding out all legal precedents of the Court referring to any possible "legal case". In addition, in the Ministry of Foreign Affairs an IBM 360/40 is operating for the management of international treaties.
- in Belgium studies are being conducted by CREDOC (Centre de Recherches d'études et documentation juridiques).
- in Germany a data bank for legal documentation has been planned by the Federal Ministry of Justice.

Also in the United States the Library of Congress has put into function an information system dealing with all congressional legislation. The variety of data to be collected by this system of legislative documentation would require, in our opinion, the adoption of an extra-large computer by 1980 (Fig.XI.16) in at least four countries: France, Germany, United Kingdom and Italy. This need will probably be felt also, if integration of data coming from different sources cannot be achieved (law, doctrine, legislation), but if particular data banks are created for the information coming from each particular source.

FIG. XI. 16

SUBSYSTEM: LAW DATA BANK




1 Organization of the Central Office and/or system integration

2 Data Bank setting up (extra-large computer )

3 Management of data retrieval.

4 Public Administration subsystems integration

## 6. Local government

### 6.1. Preliminary remarks

The different organizations and tasks of the local governments in the countries examined allows only a very general definition of the local governments' information system and of administrative and organizational requirements for some of the applications.

First of all, we can make a distinction from the EDP viewpoint between two different kinds of local governments with different administrative and informational problems: municipalities and governments, of larger areas such as Italian, Belgian and Dutch provinces; departments and program regions in France; urban and rural districts in England; German Länder; metropolitan authorities such as the Greater London Council and the district of the region of Paris.

The number of computers installed in local administrations during the last few years has considerably increased, as well as the joint utilization of one processing centre by several local governments, even if they are small: thus a Dutch centre works for various municipalities, and, among the boroughs of London, there exists the Joint Computer Committee, etc. Because of these experiments in cooperation it is difficult to draw a demarcation line among the sizes of those cities which require the use of a computer and those which do not.

Also within the large cities two different trends exist: on the one hand the installation of only one processing centre used by all public services for their processing needs and which would seem the more widespread trend; on the other hand the realization of several centres for various purposes within one city.

In the framework of the information system of local organizations it is also useful to make a distinction between the planning and programming applications and those of ordinary administration. At present the procedures of ordinary administration are quite well defined and give rise to various applications whose way of information collection and processing is generally known in order to originate specific outputs. On the contrary, the programming and planning activities are less well defined, and the information system differs from the one used in the ordinary administration activity. In fact, planning needs a flexible and open ended system.

The differences between operational and planning systems, which do not preclude the sharing of a common data base, exclude, however, the concept of a single information system for all the activities performed by a metropolitan area.

Therefore, we will examine only some applications connected with the activities of ordinary administration (1). Not even in the US information systems for Planning are very diffused. In state and local administrations use of computers in urban planning concerns essentially transportation planning: Chicago, Philadephia, New York and Seattle have successfully experimented with both graphic techniques and simulation models to adjust the means of transportation to the increasing demands of city traffic. However, the Planning Agencies

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(1) An information system for urban planning is illustrated in: U.S. Department of Housing and Urban Development: Urban regional information systems: support for planning in Metropolitan areas.

of many states and cities encounter many difficulties with computer models of land development and processing of planning data (1).

(1) G.C. Hemmens-Planning agency experience with urban development models and data processing (Journal of the American Institute of Planners, September 1968.

## 6.2. Municipal services

The typical applications of local organizations concern primarily the municipal services.
The municipal services can be divided into three large groups:

1. Registration-type applications
   - Election boards
   - Draft boards
   - Education
   - Welfare and assistance
   - Civil registers
   - Health registers
   - Tax registers
   - Employment registers

2. Fiscal type applications
   - Direct taxes
   - Family taxes
   - Duties
   - Tax accounting
   - Fine accounting

3. General accounting applications and others
   - Manpower
   - Stocks
   - Urban health
   - Municipal pharmacies
   - Property control

- Control of a person's investments
- Personnel service
- Gas, light, water invoicing
- Data banks
- Statistics.

It is evident that all these services have analogous procedures in the municipalities , but at the same time that not all municipalities are of such sizes as to justify the use of a computer. According to an Italian project (1) these services could be performed by information systems on three levels:

1. Pilot centres

Equipped with extra-large computers they will be installed in the largest cities, that is cities of about 1,500,000/ 2,000,000 inhabitants.

They would perform the following functions:

- processing of data referring to the municipality in which they are installed
- analysis of standard procedures, creation of software packages for all the other centres
- time sharing processing for the nearest municipalities linked by terminal to the calculation centre
- intermunicipality statistics and processing; concentration of messages for the Public Administration's integrated subsystems.

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(1) Arranged by the Bordoni Foundation under the guidance of Prof. Selan.

2. Service centres

These would give help with medium computers to data processing of municipalities which are linked to the centre by teleprocessing: for example, in Italy, the installation of 25 such centres has been scheduled by 1980.
In addition to the typical processing of the pilot centres with the exception of the software packages, these centres could lend their services also to private persons, especially industrial, commercial companies, etc. for all those processings whose outputs are input data in the municipality processings (typical are consumption taxes).

3. Terminals

They should be installed in all municipalities.
Creation of a processing system as described above would require, like all Public Administration processings, a phase of studying and organization of data and different procedures and, above all, the overcoming of a large part of the local governments' present rules.
Different is the system hypothesized by the "Institution for the development of municipal automation" of the Union of Dutch Municipalities (1).
The cities of a certain importance have all joined together for the purpose of realizing a centralization of data processing, as illustrated by the enclosed scheme.
The integral system of which some municipalities manage partial projects (in Amsterdam the project for real estate, in Rotterdam the personnel and population systems) can yield

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(1) Informatie No. 3, March 1969.

satisfactory results only, if a sufficient number of municipalities participate therein and, furthermore, if each, choosing his own equipment is aware of the requirements which arise from the togetherness of the partial projects, also if they have been studied by another municipality (thus, for example, all the previously chosen computers must have at least one 64 K memory).

A similar direction is being followed by the Belgian Union of Municipalities which has created a foundation for the expansion of EDP in local governments which will be, among other things, connected by teletransmission to the National Register of the Belgian population in Brussels. Already today, AIM (Association Intercomunale de Mécanographie) performs service centre-type functions for the local governments in the two centres of Liège and Brussels.

## 6.3. Area Traffic Control

Incorporation of a computer into traffic control systems permits the use of several alternative control methods. Various programs can be put into action during specific periods of the day, week or year, alternatively; various programs can be automatically applied by the monitor in order to determine the traffic flow in the area.
In addition, use of a computer permits a rapid assessment of the traffic situation, and calling into function the most appropriate control method can maintain the traffic flow at an optimal level every moment.
Further advantages of a centralized control by computer can be the following:

1) The use of signal programs can easily be modified in order to improve the smooth running of traffic, and best control programs can be realized easily;

2) The additional signal installations can be incorporated easily into the control system;

3) Defective monitors and equipment of control can be singled out by automatic selfcontrol;

4) It is possible to carry out studies about traffic using the information from the monitor in the control system without having to resort to the installation of additional equipment.

On the other hand, it cannot be expected that a "centralized control system" could handle automatically any traffic situation which can occur: it is advisable, if not indispensable, to provide means which are able to interrupt the

automatic control and provide consequently manual control. The economic justification of capital investment in a centralized control system through a computer is based principally on the expected reduction in delays and on the saving which such a reduction would bring with it for the community.

Considering, for example, that traditional equipment for a circle's traffic control costs around $ 300.000 and is of advantage only to the nearest surroundings, it becomes obvious that any control plan by computer from which a much larger area would benefit at the same cost, presents several points in its favour.
The results obtained until now have been improvements in the existing traffic regulation system: in the United Kingdom, for example, where systems of this type are in operation, time savings of 15% are obtained as well as profits for the community which are three times higher than the invested capital. Surveillance of highways and control of parked cars in an area are associated to the traffic control system. The purpose of highway surveillance is to control traffic by the installation of apparatus along the highways and to make signalling devices function to advise the driver of impending risks.
The instruments installed along the highway transmit information to the control centre where the computer collects and processes the data and takes the necessary control decisions before transmitting them to the signalling devices located along the highway.

Another problem which could be solved by a central computer is that of parking: the parked vehicles form an integrating factor of traffic in the central areas of large cities and the need to park the car for long periods requires that high-rise parking houses are provided.

In order to exploit them to the maximum it is necessary to indicate to both commuters and drivers which are in transit in the city the parking situation within a certain area. However, given the ever increasing traffic, this operation becomes ever more complicated and makes some form of centralized traffic control necessary.
By centralizing parking control, the drivers can be directed by means of "signals" to the roads chosen and be informed about the availability of parking spaces.

## 6.4. Water-Air Control

Although at present the activity of monitoring the air and water quality is small, it is predictable that, due to the dimensions of this problem, governments will show greater interest in this respect. Various programs exist already, generally in the direction of collecting and analyzing basic information about the quality of air and water through samples collected periodically and analyzed with the usual laboratory techniques.

Obviously, these procedures do not assure adequate control and they have been improved by using instruments at various survey points which furnish continuous means of comparison; in the meantime, multiparameter control systems have been developed.

The computer has the task of forecasting the air's quality (for each urban area) with an advance varying from 6 to 48 hours, based on data about atmospheric conditions.

Then the computer processes an "emission model" (which takes into account quantity and quality of substantial polluters, area by area, weather forecasts and daily, weekly and seasonal variations) and a "dissipation model" (which could control the air, area by area, based on the wind's speed and atmospheric conditions). Comparing the actual conditions with an "acceptability model", memorized previously, the computer could indicate in advance corrective actions which should to be taken in the case that pollution reaches dangerous levels. A system for pollution control foresees thus medium-size computers for each area, approximately the size of a region, and a giant central computer operating in time-sharing for scientific calculations and the acceptability models.

Also for water pollution control, which uses, like air pollution control, continuous multiparameter monitoring systems, instruments are required for continuous survey by the observation stations as well as a direct connection by teletransmission to the central installations of data collection and elaboration.

In the US which are the leader in this field, the Federal Water Pollution Control Administration gathers information from thousands of observation points with a computerized system called STORET (Storage and Retrieval), and distributes this information to other local government organs, presupposing that the latter has been previously entrusted with the task of air and water pollution control.

In Europe water control is often performed at a local level and joined together with other hydrographic control activities all performed in a hydrographic basin. Typical is the Ruhr basin where activities concerning the water are performed under the control of eight associations of users of this same water.

In Italy the Regional Union of the Tuscan Provinces has thought out a system for rational management of the water resources (1) which collects data from a net of pluviometers and hydrometric devices installed in the water collecting basin in a data processing centre which directs a mathematical model of the basin and has the task to:

- predict the probable changes in water levels;
- indicate opportune maneuvres of the various devices in order to guarantee rational employment of the water resources.

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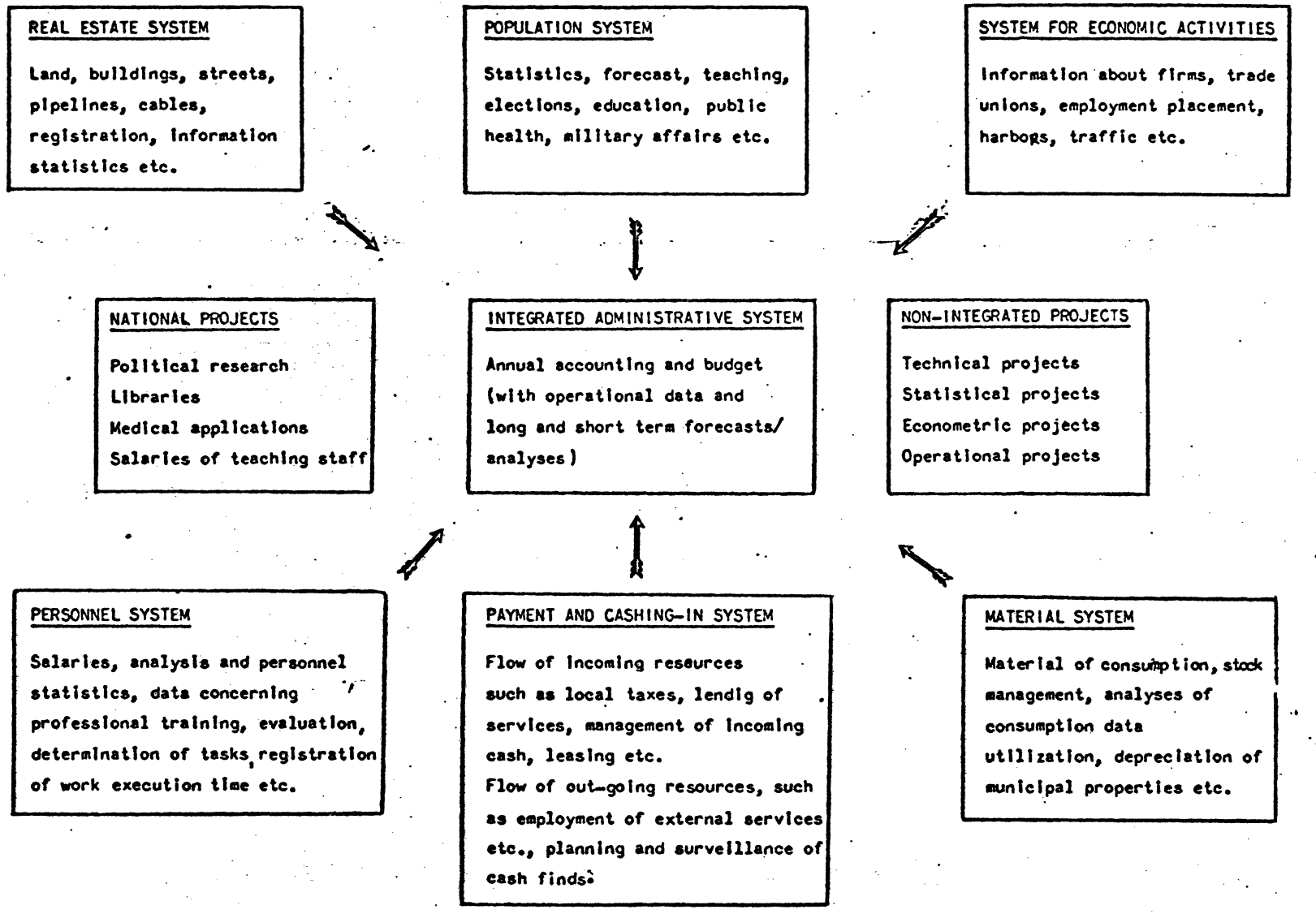
(1) Regional Union for the Tuscan Provinces - Project Etruria, Florence, 1969.

FIG. XI.17

SCHEME OF MUNICIPAL INFORMATION SYSTEMS AND OTHER ELECTRONIC APPLICATIONS



## 7. Concluding Remarks

Forecasts about requests for extra-large computers, in order to realize the hypothesized information subsystems, by central governments in the countries considered are listed in the following table:

FORECASTS OF EXTRA-LARGE COMPUTER INSTALLATIONS PER SUBSYSTEM IN PUBLIC ADMINISTRATIONS OF THE EEC COUNTRIES AND THE U.K. DURING THE SEVENTIES

| | 1970-1975 | | | | | | 1975-1980 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BELGIUM | FRANCE | GERMANY | ITALY | NETHERLANDS | U.K. | BELGIUM | FRANCE | GERMANY | ITALY | NETHERLANDS | U.K. |
| STATE BUDGET | | | | | | | } x | x | x | x | } x | x |
| TAXATION | | | | | | x | | x | x | x | | |
| STATISTICS | | | | | | | | x | x | x | | x |
| CENTRAL POPULATION REGISTER | | | | | | | | x | x | x | | x |
| LABOR FORCE REGISTER | | x | | | | | | | x | x | | x |
| SOCIAL SECURITY | | | | | | x | | x | | x | | x |
| PUBLIC HEALTH | | | | | | | | | | | | |
| AIR TRAFFIC CONTROL | | | | | | x | | x | x | x | | x |
| METEOROLOGY | | x | | | | x | | x | x | x | | x |
| LAW DATA BANK | | | | | | | | x | x | x | | x |

The major past of the installations should be realized by 1975-1980.

It is, however, not possible to formulate forecasts about requests for extra-large computers by local governments, because they depend from current and future reorganizations of their territorial jurisdiction.

# A N N E X E S

TABLE XI.a.

UNITED KINGDOM

COMPUTERS INSTALLED BY SIZE CLASSES FROM 1962 TO 1968

BRANCH: PUBLIC ADMINISTRATION

| CLASS | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | AVERAGE ANNUAL GROWTH |
|---|---|---|---|---|---|---|---|---|
| | NUMBER | | | | | | | |
| DESK | 2 | 7 | 10 | 14 | 26 | 40 | 229 | 120,3 |
| SMALL | 54 | 81 | 124 | 154 | 201 | 332 | 338 | 35,8 |
| MEDIUM | 3 | 9 | 18 | 24 | 30 | 42 | 48 | 58,7 |
| LARGE | 1 | 4 | 5 | 6 | 9 | 12 | 21 | 66,1 |
| EXTRA LARGE | - | - | - | - | - | - | - | - |
| UNCLASSIFIED | 2 | - | - | - | - | 4 | 7 | 23,2 |
| TOTAL | 62 | 101 | 157 | 198 | 266 | 430 | 643 | 47,7 |
| TOTAL EXCLUDING DESK | 60 | 94 | 147 | 184 | 240 | 390 | 414 | 38,0 |
| | PERCENTAGE | | | | | | | |
| DESK | 3,2 | 6,9 | 6,4 | 7,1 | 9,8 | 9,3 | 35,6 | |
| SMALL | 87,1 | 80,2 | 79,0 | 77,8 | 75,5 | 77,2 | 52,6 | |
| MEDIUM | 4,9 | 8,9 | 11,4 | 12,1 | 11,3 | 9,8 | 7,4 | |
| LARGE | 1,6 | 4,0 | 3,2 | 3,0 | 3,4 | 2,8 | 3,3 | |
| EXTRA LARGE | - | - | - | - | - | - | - | |
| UNCLASSIFIED | 3,2 | - | - | - | - | 0,9 | 1,1 | |
| TOTAL | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | |

SOURCE: SORIS, ON THE BASIS OF COMPUTER SURVEY, MARCH OF EACH YEAR.

FOLLOWS TABLE XI.a.

UNITED KINGDOM

COMPUTERS INSTALLED BY SIZE CLASSES FROM 1962 TO 1968

BRANCH: PUBLIC ADMINISTRATION

| CLASS | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | AVERAGE ANNUAL GROWTH |
|---|---|---|---|---|---|---|---|---|
| | VALUE (Thousands dollars) | | | | | | | |
| DESK | 22,5 | 101,7 | 130,5 | 174,6 | 278,2 | 468,7 | 2.322,3 | 116,6 |
| SMALL | 3.044,4 | 4.597,2 | 7.426,2 | 9.532,0 | 13.300,3 | 20.140,8 | 23.533,6 | 40,6 |
| MEDIUM | 697,2 | 1.785,6 | 3.300,0 | 4.345,2 | 5.641,2 | 8.132,4 | 9.447,6 | 54,4 |
| LARGE | 425,0 | 2.374,0 | 2.974,0 | 2.860,0 | 4.077,0 | 5.487,0 | 8.715,0 | 65,4 |
| EXTRA LARGE | - | - | - | - | - | - | - | - |
| TOTAL | 4.189,1 | 8.858,5 | 13.830,7 | 16.911,8 | 23.296,7 | 34.228,9 | 44.018,5 | 48,0 |
| TOTAL EXCLUDING DESK | 4.166,6 | 8.675,8 | 13.700,2 | 16.737,2 | 23.018,5 | 33.760,2 | 41.696,2 | 46,8 |
| | PERCENTAGE | | | | | | | |
| DESK | 0,5 | 1,1 | 0,9 | 1,0 | 1,2 | 1,4 | 5,3 | |
| SMALL | 72,7 | 51,9 | 53,7 | 56,4 | 57,1 | 58,8 | 53,5 | |
| MEDIUM | 16,6 | 20,2 | 23,9 | 25,7 | 24,2 | 23,8 | 21,4 | |
| LARGE | 10,2 | 26,8 | 21,5 | 16,9 | 17,5 | 16,0 | 19,8 | |
| EXTRA LARGE | - | - | - | - | - | - | - | |
| TOTAL | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | |

SOURCE: SORIS, ON THE BASIS OF COMPUTER SURVEY, MARCH OF EACH YEAR.

UNITED KINGDOM

COMPUTERS INSTALLED BY SIZE CLASSES FROM 1962 TO 1968

BRANCH: ARMED SERVICE

| CLASS | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | AVERAGE ANNUAL GROWTH |
|---|---|---|---|---|---|---|---|---|
| | NUMBER | | | | | | | |
| DESK | - | 3 | 3 | 1 | 1 | 7 | 134 | 113,8 |
| SMALL | 9 | 9 | 20 | 37 | 33 | 97 | 61 | 37,6 |
| MEDIUM | 1 | 2 | 2 | 4 | 5 | 6 | 6 | 34,8 |
| LARGE | 1 | 2 | 2 | 4 | 4 | 4 | 4 | 26,0 |
| EXTRA LARGE | - | - | - | - | - | - | - | - |
| UNCLASSIFIED | - | - | - | - | - | 1 | 5 | 400,0 |
| TOTAL | 11 | 16 | 27 | 46 | 43 (1) | 115 | 210 | 63,5 |
| TOTAL EXCLUDING DESK | 11 | 13 | 24 | 45 | 42 | 108 | 76 | 38,0 |
| | PERCENTAGE | | | | | | | |
| DESK | - | 18,8 | 11,1 | 2,2 | 2,3 | 6,1 | 63,8 | |
| SMALL | 81,8 | 56,1 | 74,1 | 80,4 | 76,8 | 84,3 | 29,0 | |
| MEDIUM | 9,1 | 12,5 | 7,4 | 8,7 | 11,6 | 5,2 | 2,9 | |
| LARGE | 9,1 | 12,5 | 7,4 | 8,7 | 9,3 | 3,5 | 1,9 | |
| EXTRA LARGE | - | - | - | - | - | - | - | |
| UNCLASSIFIED | - | - | - | - | - | 0,9 | 2,4 | |
| TOTAL | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | |

SOURCE: SORIS, ON THE BASIS OF COMPUTER SURVEY, MARCH OF EACH YEAR.

(1) 1 UNIVAC 1107, by mistake classified in this sector from Computer Survey has been now included in Gouvernments Departments.

follows TABLE XI.a

UNITED KINGDOM

COMPUTERS INSTALLED BY SIZE CLASSES FROM 1962 TO 1968

BRANCH: ARMED SERVICE

| CLASS | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | AVERAGE ANNUAL GROWTH |
|---|---|---|---|---|---|---|---|---|
| | VALUE (Thousands dollars) | | | | | | | |
| DESK | - | 47,7 | 47,7 | 15,3 | 15,3 | 99,0 | 1.248,2 | 92,1 |
| SMALL | 702,0 | 619,2 | 1.462,8 | 2.085,0 | 2.145,6 | 4.521,5 | 3.859,1 | 32,8 |
| MEDIUM | 276,0 | 552,0 | 552,0 | 900,0 | 1.050,0 | 1.368,0 | 1.368,0 | 30,6 |
| LARGE | 425,0 | 850,0 | 850,0 | 1.498,0 | 1.570,0 | 1.570,0 | 1.570,0 | 24,3 |
| EXTRA LARGE | - | - | - | - | - | - | - | - |
| TOTAL | 1.403,0 | 2.068,9 | 2.912,5 | 4.498,3 | 4.780,9 | 7.558,5 | 8.045,3 | 33,8 |
| TOTAL EXCLUDING DESK | 1.403,0 | 2.021,2 | 2.864,8 | 4.483,0 | 4.765,6 | 7.459,5 | 6.797,1 | 30,1 |
| | PERCENTAGE | | | | | | | |
| DESK | - | 2,3 | 1,6 | 0,3 | 0,3 | 1,3 | 15,5 | |
| SMALL | 50,0 | 29,9 | 50,2 | 46,4 | 44,9 | 59,8 | 48,0 | |
| MEDIUM | 19,7 | 26,7 | 19,0 | 20,0 | 22,0 | 18,1 | 17,0 | |
| LARGE | 30,3 | 41,1 | 29,2 | 33,3 | 32,8 | 20,8 | 19,5 | |
| EXTRA LARGE | - | - | - | - | - | - | - | |
| TOTAL | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | |

SOURCE: SORIS, ON THE BASIS OF COMPUTER SURVEY, MARCH OF EACH YEAR.

UNITED KINGDOM

COMPUTERS INSTALLED BY SIZE CLASSES FROM . 1962 TO 1968

BRANCH: GOVERNMENT DEPARTMENTS

| CLASS | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | AVERAGE ANNUAL GROWTH |
|---|---|---|---|---|---|---|---|---|
| | NUMBER | | | | | | | |
| DESK | - | 1 | 1 | 4 | 6 | 10 | 45 | 114,1 |
| SMALL | 22 | 34 | 43 | 29 | 39 | 61 | 54 | 16,1 |
| MEDIUM | 1 | 4 | 9 | 7 | 10 | 19 | 13 | 53,3 |
| LARGE | - | 2 | 3 | 2 | 3 | 6 | 9 | 35,1 |
| EXTRA LARGE | - | - | - | - | - | - | - | - |
| UNCLASSIFIED | 2 | - | - | - | - | 3 | 2 | - |
| TOTAL | 25 | 41 | 56 | 42 | 58 | 99 | 123 | 30,4 |
| TOTAL EXCLUDING DESK | 25 | 40 | 55 | 38 | 52 | 89 | 78 | 20,9 |
| | PERCENTAGE | | | | | | | |
| DESK | - | 2,4 | 1,8 | 9,5 | 10,4 | 10,1 | 36,6 | |
| SMALL | 88,0 | 82,9 | 76,8 | 69,0 | 67,2 | 61,6 | 43,9 | |
| MEDIUM | 4,0 | 9,8 | 16,1 | 16,7 | 17,2 | 19,2 | 10,6 | |
| LARGE | - | 4,9 | 5,4 | 4,8 | 5,2 | 6,1 | 7,3 | |
| EXTRA LARGE | - | - | - | - | - | - | - | |
| UNCLASSIFIED | 8,0 | - | - | - | - | 3,0 | 1,6 | |
| TOTAL | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | |

SOURCE: SORIS, ON THE BASIS OF COMPUTER SURVEY, MARCH OF EACH YEAR.

follows TABLE XI.a

UNITED KINGDOM

## COMPUTERS INSTALLED BY SIZE CLASSES FROM 1962 TO 1968

BRANCH: GOVERNMENT DEPARTMENTS

| CLASS | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | AVERAGE ANNUAL GROWTH |
|---|---|---|---|---|---|---|---|---|
| | VALUE (Thousands dollars) | | | | | | | |
| DESK | - | 16,2 | 16,2 | 54,9 | 69,1 | 103,3 | 477,7 | 96,7 |
| SMALL | 1.221,6 | 1.921,2 | 2.422,2 | 1.900,6 | 2.355,1 | 3.576,8 | 3.471,4 | 19,0 |
| MEDIUM | 276,0 | 769,2 | 1.622,4 | 1.327,2 | 1.921,2 | 3.655,2 | 2.641,2 | 45,7 |
| LARGE | - | 1.524,0 | 2.124,0 | 1.362,0 | 1.787,0 | 3.197,0 | 4.169,0 | 22,3 |
| EXTRA LARGE | - | - | - | - | - | - | - | - |
| TOTAL | 1.497,6 | 4.230,6 | 6.184,8 | 4.644,7 | 6.132,4 | 10.532,3 | 10.759,3 | 38,9 |
| TOTAL EXCLUDING DESK | 1.497,6 | 4.214,4 | 6.168,6 | 4.589,8 | 6.063,3 | 10.429,0 | 10.281,6 | 37,9 |
| | PERCENTAGE | | | | | | | |
| DESK | - | 0,4 | 0,3 | 1,2 | 1,1 | 1,0 | 4,4 | |
| SMALL | 81,6 | 45,4 | 39,2 | 40,9 | 38,4 | 34,0 | 32,3 | |
| MEDIUM | 18,4 | 18,2 | 26,2 | 28,6 | 31,3 | 34,7 | 24,6 | |
| LARGE | - | 36,0 | 34,3 | 29,3 | 29,2 | 30,3 | 38,7 | |
| EXTRA LARGE | - | - | - | - | - | - | - | |
| TOTAL | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | |

SOURCE: SORIS, ON THE BASIS OF COMPUTER SURVEY, MARCH OF EACH YEAR.

follows TABLE XI.a

UNITED KINGDOM

COMPUTERS INSTALLED BY SIZE CLASSES FROM 1962 TO 1968

BRANCH: LOCAL GOVERNMENT

| CLASS | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | AVERAGE ANNUAL GROWTH |
|---|---|---|---|---|---|---|---|---|
| | NUMBER | | | | | | | |
| DESK | 2 | 2 | 4 | 6 | 8 | 16 | 32 | 58,7 |
| SMALL | 18 | 30 | 45 | 71 | 93 | 144 | 173 | 45,8 |
| MEDIUM | 1 | 3 | 7 | 12 | 13 | 13 | 13 | 53,3 |
| LARGE | - | - | - | - | - | 1 | 1 | - |
| EXTRA LARGE | - | - | - | - | - | - | - | - |
| UNCLASSIFIED | | | | | | | | |
| TOTAL | 21 | 35 | 56 | 89 | 114 | 174 | 219 | 47,8 |
| TOTAL EXCLUDING DESK | 19 | 33 | 52 | 83 | 106 | 158 | 187 | 46,4 |
| | PERCENTAGE | | | | | | | |
| DESK | 9,5 | 5,7 | 7,1 | 6,7 | 7,0 | 9,2 | 14,6 | |
| SMALL | 85,7 | 85,7 | 80,4 | 79,8 | 81,6 | 82,8 | 79,0 | |
| MEDIUM | 4,8 | 8,6 | 12,5 | 13,5 | 11,4 | 7,5 | 5,9 | |
| LARGE | - | - | - | - | - | 0,6 | 0,5 | |
| EXTRA LARGE | - | - | - | - | - | - | - | |
| UNCLASSIFIED | - | - | - | - | - | - | - | |
| TOTAL | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | |

SOURCE: SORIS, ON THE BASIS OF COMPUTER SURVEY, MARCH OF EACH YEAR.

follows TABLE XI.a

UNITED KINGDOM

## COMPUTERS INSTALLED BY SIZE CLASSES FROM 1962 TO 1968

BRANCH: LOCAL GOVERNMENT

| CLASS | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | AVERAGE ANNUAL GROWTH |
|---|---|---|---|---|---|---|---|---|
| | VALUE (Thousands dollars) | | | | | | | |
| DESK | 22,5 | 22,5 | 45,0 | 67,5 | 90,0 | 198,0 | 396,9 | 61,3 |
| SMALL | 859,2 | 1.615,2 | 2.552,4 | 4.342,8 | 6.175,2 | 9.880,8 | 12.356,9 | 55,9 |
| MEDIUM | 145,2 | 464,4 | 1.125,6 | 1.972,8 | 2.320,8 | 2.338,8 | 2.338,8 | 58,9 |
| LARGE | - | - | - | - | - | 396,0 | 396,0 | - |
| EXTRA LARGE | - | - | - | - | - | - | - | - |
| TOTAL | 1.026,9 | 2.102,1 | 3.723,0 | 6.383,1 | 8.586,0 | 12.813,7 | 15.488,6 | 57,2 |
| TOTAL EXCLUDING DESK | 1.004,4 | 2.079,6 | 3.678,0 | 6.315,6 | 8.496,0 | 12.615,6 | 15.091,7 | 57,1 |
| | PERCENTAGE | | | | | | | |
| DESK | 2,2 | 1,1 | 1,2 | 1,1 | 1,1 | 1,5 | 2,6 | |
| SMALL | 83,7 | 76,8 | 68,6 | 68,0 | 71,9 | 77,1 | 79,8 | |
| MEDIUM | 14,1 | 22,1 | 30,2 | 30,9 | 27,0 | 18,3 | 15,1 | |
| LARGE | - | - | - | - | - | 3,1 | 2,5 | |
| EXTRA LARGE | - | - | - | - | - | - | - | |
| TOTAL | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | |

SOURCE: SORIS, ON THE BASIS OF COMPUTER SURVEY, MARCH OF EACH YEAR.

follows TABLE XI.a

UNITED KINGDOM

COMPUTERS INSTALLED BY SIZE CLASSES FROM . 1962 TO 1968

BRANCH: PUBLIC BODIES

| CLASS | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | AVERAGE ANNUAL GROWTH |
|---|---|---|---|---|---|---|---|---|
| | NUMBER | | | | | | | |
| DESK | - | 1 | 2 | 3 | 11 | 7 | 18 | 78,3 |
| SMALL | 5 | 8 | 16 | 17 | 36 | 30 | 50 | 46,8 |
| MEDIUM | - | - | - | 1 | 2 | 4 | 16 | 152,0 |
| LARGE | - | - | - | - | 2 | 1 | 7 | 87,1 |
| EXTRA LARGE | - | - | - | - | - | - | - | - |
| UNCLASSIFIED | | | | | | | | |
| TOTAL | 5 | 9 | 18 | 21 | 51 | 42 | 91 | 62,2 |
| TOTAL EXCLUDING DESK | 5 | 8 | 16 | 18 | 40 | 35 | 73 | 56,3 |
| | PERCENTAGE | | | | | | | |
| DESK | - | 11,1 | 11,1 | 14,3 | 21,6 | 16,7 | 19,8 | |
| SMALL | 100,0 | 88,9 | 88,9 | 80,9 | 70,6 | 71,4 | 54,9 | |
| MEDIUM | - | - | - | 4,8 | 3,9 | 9,5 | 17,6 | |
| LARGE | - | - | - | - | 3,9 | 2,4 | 7,7 | |
| EXTRA LARGE | - | - | - | - | - | - | - | |
| UNCLASSIFIED | - | - | - | - | - | - | - | |
| TOTAL | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | |

SOURCE: SORIS, ON THE BASIS OF COMPUTER SURVEY, MARCH OF EACH YEAR.

follows TABLE XI.a

UNITED KINGDOM

## COMPUTERS INSTALLED BY SIZE CLASSES FROM 1962 TO 1968

BRANCH: PUBLIC BODIES

| CLASS | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | AVERAGE ANNUAL GROWTH |
|---|---|---|---|---|---|---|---|---|
| | VALUE (Thousands dollars) | | | | | | | |
| DESK | - | 15,3 | 21,6 | 36,9 | 103,8 | 68,4 | 199,5 | 67,1 |
| SMALL | 261,6 | 441,6 | 988,8 | 1.203,6 | 2.624,4 | 2.161,7 | 3.846,2 | 56,5 |
| MEDIUM | - | - | - | 145,2 | 349,2 | 770,4 | 3.099,6 | 177,4 |
| LARGE | - | - | - | - | 720,0 | 324,0 | 2.580,0 | 89,3 |
| EXTRA LARGE | - | - | - | - | - | - | - | - |
| TOTAL | 261,6 | 456,9 | 1.010,4 | 1.385,7 | 3.797,4 | 3.324,5 | 9.725,3 | 82,7 |
| TOTAL EXCLUDING DESK | 261,6 | 441,6 | 988,8 | 1.348,8 | 3.693,6 | 3.256,1 | 9.525,8 | 82,0 |
| | PERCENTAGE | | | | | | | |
| DESK | - | 3,3 | 2,1 | 2,7 | 2,7 | 2,1 | 2,1 | |
| SMALL | 100,0 | 96,7 | 97,9 | 86,8 | 69,1 | 65,0 | 39,5 | |
| MEDIUM | - | - | - | 10,5 | 9,2 | 23,2 | 31,9 | |
| LARGE | - | - | - | - | 19,0 | 9,7 | 26,5 | |
| EXTRA LARGE | - | - | - | - | - | - | - | |
| TOTAL | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | |

SOURCE: SORIS, ON THE BASIS OF COMPUTER SURVEY, MARCH OF EACH YEAR.

TABLE XI.b.

## COMPUTERS INSTALLED IN HOSPITALS BY SIZE CLASSES

| HOSPITAL | TOWN | COMPUTERS INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| UNITED KINGDOM | | | | | | |
| REGIONAL HOSPITAL BOARD | BIRMINGHAM | | ICL SYSTEM 4-40 | | | Complete financial accounts including balanced ledgers, cost ledgers, priced stores ledgers, schedules of accounts, payroll cheques and remittance advice notes, hospital activity analysis (management and clinical statisties); PERT techniques in planning building programme, management information system |
| EAST ANGLIAN REGIONAL HOSPITAL | CAMBRIDGE | (ICL 1903) | | | | Accounting, statistics |
| EASTERN SCOTTISH HOSPITAL BOARD | DUNDEE | ICL 1901 | | | | Financial accounting medical statistics, payroll |
| HAMMERSMITH HOSPITAL | LONDON | MARCONI ELLIOTT 903 | | | | Biochemical analysis |
| HOSPITALS' COMPUTER CENTRE FOR LONDON, ST. THOMAS' HOSPITAL | LONDON | ICL 1904 E | | | | Work on behal of London's Teaching Hospitals and thr North East and Sout East Metropolitan Regional Hospital Boards (payrrol, accounting, management information, technical calculations) |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM NOVEMBER / DECEMBER 1969

follows TABLE XI.b.

## COMPUTERS INSTALLED IN HOSPITALS BY SIZE CLASSES

| HOSPITAL | TOWN | COMPUTERS INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows : UNITED KINGDOM | | | | | | |
| KING'S COLLEGE HOSPITAL | LONDON | | ICL 1905 E | | | On-line medical record system in real-time, direct access central record of patients, analysis of laboratory and other tests, management information system, scientific research, payroll, financial ledger |
| LEEDS REGIONAL HOSPITAL BOARD | LEEDS | ICL 1902 | | | | Financial work, including payroll, medical and statistical work, expenditure analysis, stores ledger |
| LIVERPOOL REGIONAL HOSPITAL BOARD | LIVERPOOL | ICL 1902 | | | | Finalcial work, medical statistics, payroll, stores ledger, hospital activity analysis |
| THE LONDON HOSPITAL | LONDON | ICL 803 | | | | Payroll, finance, administration, medical records, operational research, medical research and teaching (Payroll, finance, administration, medical records, operational research, medical research, teaching) |
| MANCHESTER REGIONAL HOSPITAL | MANCHESTER | ICL SYSTEM 4-30 | | | | Payroll, medical records, nurse records, nurse allocation system, dietary control investigations, |

SOURCE : COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM NOVEMBER / DECEMBER 1969

follows TABLE XI.b.

## COMPUTERS INSTALLED IN HOSPITALS BY SIZE CLASSES

| HOSPITAL | TOWN | COMPUTERS INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows: | | | | | | |
| UNITED KINGDOM | | | | | | stores control, financial work; service to 35 hospital authorities, automatic call up of blood transfusion donors |
| NEWCASTLE - UPON - TYNE REGIONAL HOSPITAL BOARDS | NEWCASTEL UPON-TYNE | ICL 1902 | | | | Hospital accounting, including payroll; hospital statistics, operational research |
| NORTH STAFFORDSHIRE HOSPITAL CENTRE, BIRMINGAM REGIONAL HOSPITAL BOARD | STOKE - ON-TRENT | | (ICL SYSTEM) 4 - 50 | | | Large hospital information system: out-patient appointments laboratory tests, etc; in-patient waiting, bed allocation, records |
| OXFORD REGIONAL HOSPITAL BOARD, ROYAL BERKS HOSPITAL | READING | (DEC PDP 8) | | | | Blood sample analysis |
| POOLE GENERAL HOSPITAL | POOLE | MARCONI ELLIOTT 903 | | | | Biochemical analysis, statistical programmes for quality control |

SOURCE : COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM NOVEMBER / DECEMBER 1969

follows TABLE XI.b.

## COMPUTERS INSTALLED IN HOSPITALS BY SIZE CLASSES

| HOSPITAL | TOWN | COMPUTERS INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows: | | | | | | |
| UNITED KINGDOM | | | | | | |
| ROYAL VICTORIA HOSPITAL | BELFAST | MARCONI ELLIOTT MYRIAD II | | | | On line monitoring of heart patients- |
| ST. BARTHOLOMEW'S HOSPITAL | LONDON | 2 DDP 516 | | | | Medical research |
| ST. STEPHEN'S HOSPITAL | LONDON | MARCONI ELLIOTT 903 | | | | Biochemical analysis |
| SHEFFIELD REGIONAL HOSPITAL BOARD | SHEFFIELD | MARCONI ELLIOTT 903 | (ICL SYSTEM) 4 - 40 | | | (Financial ledger invoincing, payroll, information systems, mathematical and scientific calculation) Development of chemical pathology services (data link to ICL 4-40) |
| SOUTH EASTERN REGIONAL HOSPITAL BOARD | EDIMBURG | ICL 1901<br>ICL 803 | | | | Payroll, stores, payments to creditors, financial and stores ledger, equipment control for capital projects, medical statistics . Training of medical staff in the region on computer. |
| SOUTH WEST METROPOLITAN AND WESSEX REGIONAL HOSPITAL BOARS'SOINT COMPUTER CENTRE | WINCHESTER | ICL 1902 | | | | Hospital accounting including payroll; hospital |

SOURCE : COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM NOVEMBER / DECEMBER 1969

follows TABLE XI.b.

## COMPUTERS INSTALLED IN HOSPITALS BY SIZE CLASSES

| HOSPITAL | TOWN | COMPUTERS INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows: | | | | | | |
| UNITED KINGDOM | | | | | | |
| | | | | | | activity analysis and financial, statistical and medical processing service to various hospital authorities; community Health information system |
| SOUTH WESTERN REGIONAL HOSPITAL | BRISTOL | ICL 1301 | | | | Hospital accounting, stores control, payroll, financial and cost records |
| UNITED BIRMINGHAM HOSPITALS | BIRMINGHAM | IBM 1440<br>IBM 1130 | | | | Integration of hospital administration, medical research, patient care and automation of clinical investigations<br>On-line analysis of pathological data from automatic analysers |
| WARWICH HOSPITAL | WARWICH | MARCONI ELLIOTT 903 | | | | Biochemical analysis. |

SOURCE : COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM NOVEMBER / DECEMBER 1969

follows TABLE XI.b.

## COMPUTERS INSTALLED IN HOSPITALS BY SIZE CLASSES

| HOSPITAL | TOWN | COMPUTERS INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows :<br>UNITED KINGDOM | | | | | | |
| WELSH HOSPITAL BOARD | CARDIFF | ICL 1903 | | | | Payroll, credotors' accouting, stores accouting and control, expenditure analysis, medical applications, critical path analysis, bills of quantities, operational research, financial ledger, costing, hospital activity analyses |
| WESTER GENERAL HOSPITAL | EDIMBURGH | MARCONI ELLIOTT 903 | | | | Measurement and analysis of brain electrical activity |
| WESTER REGIONAL HOSPITAL BOARDS | GLASGOW | ICL 1902 | | | | Wages, store control, payment of creditors, network analysis, medical projects |
| WESTMINSTER HOSPITAL | LONDON | IBM 1800 | | | | Medical research, advanced clinical applications. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM NOVEMBER /DECEMBER 1969

## COMPUTERS INSTALLED IN HOSPITALS BY SIZE CLASSES

| HOSPITALS | TOWN | COMPUTERS INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| FRANCE | | | | | | |
| CENTRE HOSPITALIER REGIONAL DE BORDEAUX | BORDEAUX | IBM 360/20 | - | - | - | ACCOUNTING, PAYROLL, INVENTORY |
| ASSISTENCE PUBLIQUE | MARSEILLE | IBM 1401 | - | - | - | |
| SOCIETE DES BAINS DE MER | MONTE CARLO | IBM 360/20 | - | - | - | |
| HOSPITAL BICHAT (INSTITUT NATIONAL DE LA SANTE) | PARIS | - | - | - | - | |
| CENTRE HOSPITAL REGION HOSPITAL DU BOCAGE | DIJON | IBM 360/20 | - | - | - | ACCOUNTING, STATISTICS, MEDICAL RESEARCH |
| HOSPITAL DE CAEN | CAEN | BULL GE GAMMA 10 | - | - | - | |
| CENTRE OSPITALIER UNIVERSITAIRE | BESANCON | BULL GE 115 | - | - | - | ADMINISTRATION, MEDICAL RESEARCH |
| CENTRE HOSPITALIER UNIVERSITAIRE | ROUEN | IBM 360/20 | - | - | - | PAYROLL, ACCOUNTING, MEDICAL RECORDS |
| HOSPITAL D'EAUBONNE | EAUBONNE | BULL GE 115 | - | - | - | ACCOUNTING, PAYROLL, INVENTORY |
| CENTRE MEDICO-CHIRURGICAL FOCH | SURESNES | IBM 360/20 | - | - | - | ACCOUNTING, PAYROLL, INVENTORY |

SOURCE: O.1. ANNUAIRE GENERAL DE L'INFORMATIQUE 1968

follows TABLE XI.b.

## COMPUTERS INSTALLED IN HOSPITALS BY SIZE CLASSES

| HOSPITAL | TOWN | COMPUTERS INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows: | | | | | | |
| FRANCE | | | | | | |
| HOSPICES CIVILS DE LYON | LYON | BULL GE GAMMA 30 | - | - | - | |
| CENTRE HOSPITALIER DE MONTPELLIER | MONTPELLIER | 2 IBM 360/20 | - | - | - | |
| CENTRE HOSPITALIER REGIONAL | CAEN | BULL GE 150 | - | - | - | |
| HOSPITAL EMILE ROUX | EAUBONNE | BULL GE 150 | - | - | - | |
| HOSPITAL DE LA SALPETRIERE | PARIS | BULL GE 150 | - | - | - | |
| HOSPICES CIVILS DE STRASBOURG - CENTRE OSPITALIER REGIONAL | STRASBOURG | BULL GE GAMMA 10 | - | - | - | ACCOUNTING, PAYROLL, PATIENT BILLING |
| UNITE RECHERCHE STATISTIQUE - INST. NL. SANTE ET RECHERCHES MEDICAL | VILLEJUIF | - | - | UNIVAC 1107 | - | |

SOURCE: 0-1 ANNUAIRE GENERAL DE L'INFORMATIQUE 1968

follows TABLE XI.b.

## COMPUTERS INSTALLED IN HOSPITALS BY SIZE CLASSES

| HOSPITAL | TOWN | COMPUTERS INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| ITALY | | | | | | |
| ISTITUTO FISIOTERAPICO REGINA ELE- | | | | | | |
| NA | MILANO | IBM 1130 | | | | |
| OSPEDALE FATEBENE - FRATELLI | MILANO | IBM 360/20 | | | | |
| OSPEDALE MAGGIORE | MILANO | IBM 1130 | | | | |
| OSPEDALE CIVILE | GALLARATE | IBM 360/20 | | | | |
| OSPEDALE CIVILE | VIMERCATE | IBM 360/20 | | | | |
| OSPEDALE MAGGIORE | BERGAMO | IBM 360/20 | | | | |
| OSPEDALE CIRCOLO | VARESE | IBM 360/20 | | | | |
| OSPEDALE GALLIERA | GENOVA | IBM 360/20 | | | | |
| OSPEDALE CIVILE | UDINE | IBM 360/20 | | | | |
| OSPEDALE CIVILE | VICENZA | IBM 360/20 | | | | |
| OSPEDALI RIUNITI | VERONA | IBM 1440<br>360/20, 1130 | | | | |
| OSPEDALE CIVILE | ANCONA | IBM 360/20 | | | | |
| OSPEDALI RIUNITI | PARMA | IBM 360/20 | | | | |
| OSPEDALE S.SPIRITO | ROMA | IBM 1401 | | | | |
| LABORATORIO ISTITUTO SUPERIORE | ROMA | IBM 1401 | | | | |
| DI SANITA' | | IBM 1800 | | | | |

SOURCE : DIRECT SURVEY

follows TABLE XI.b.

## COMPUTERS INSTALLED IN HOSPITALS BY SIZE CLASSES

| HOSPITAL | TOWN | COMPUTERS INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows: | | | | | | |
| ITALY | | | | | | |
| ISTITUTO PATOLOGIA CHIRURGICA | ROMA | IBM 1130 | | | | |
| OSPEDALE CIVILE | SIENA | | | | | |
| OSPEDALI RIUNITI | NAPOLI | IBM 360/20 | | | | |
| OSPEDALE CIVILE | COSENZA | IBM 360/20 | | | | |
| OSPEDALE CIVILE | SASSARI | IBM 360/20 | | | | |

SOURCE: DIRECT SURVEY

TABLE XI.c.

COMPUTERS INSTALLED BY SIZE CLASSES IN MUNICIPALITIES WITH MORE THAN 200.000 INHABITANTS

| MUNICIPALITY | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| UNITED KINGDOM | | | | | | |
| BIRMINGHAM | 1101 | ICL 1904 | | | | Integration of accounting processes: rating, payroll, pensions stock control, statistics; PERT control of building project; engineering calculations, bills of quantities, data bank, loan accounts, vehicle performance, stocks and bonds, invoicing, student grants, school medical records, housing rents. |
| GLASGOW | 960 | IBM 360/30<br>IBM 1130 | IBM 360/40 | | | Payment of creditors, payroll, expenditure/revenue accounting, rating, costing and non-accounting work (e.g. highway design), child health records. Teacher training and pupil studies. |
| LIVERPOOL | 705 | ICL 1904 | ICL XL 9. | | | Financial, technical and statistical projects, payroll, rate demands, payments, income and expenditure accounting, planning, PERT, health, traffic. Computer-controlled traffic scheme. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

follows TABLE XI.c.

COMPUTERS INSTALLED BY SIZE CLASSES IN MUNICIPALITIES WITH MORE THAN 200.000 INHABITANTS

| MUNICIPALITY | INHABITANTS thousand - | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| MANCHESTER | 616 | | ICL LEO'III | | | Payroll, pensions, payment of accounts, expenditure analyses, general rates and water charges and quarterly rents, costing, statistics, service work. |
| LEEDS | 508 | ICL 1904 | | | | Payroll, pensions, costing and store accounting, rate accounting, transport traffic analyses, civil and structural engineering calculations, network analysis, mortgages, health records, vehicle maintenance, property rents, bills of quantities, electoral registration. |
| EDINBURGH | 468 | | ICL SYSTEM 4/50 | | | Payroll, rents and rates accounting, mortgage and loan stock; electoral, valuation and assessment rolls, transport returns and statistics, public health records, traffic engineering, education department population survey; one shift a day on ICSL service bureau work. |
| BRISTOL | 429 | ICL 1500 | | | | Bills of quantity, payroll stock accounting, costing, university, grants, payments, health and |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

follows TABLE XI.c.

COMPUTERS INSTALLED BY SIZE CLASSES IN MUNICIPALITIES WITH MORE THAN 200.000 INHABITANTS

| MUNICIPALITY | INHABITANTS thousand - | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| follows BRISTOL | | | | | | housing statistics. |
| COVENTRY | 333 | | ICL LEO III | | | Payroll, rate accounting, mortgage loan accounting, income and expenditure accounting, stores control, cost accounting payment of accounts, children's health records, civil engineering calculations, bills of quantities. |
| NOTTINGHAM | 310 | ICL 1903 | | | | Payment of creditors, payroll, stores, costing, financial ledger, general rate and water charges billing and accounting, passenger transport statistics and conductors' accounts, loans and non-financial applications. |
| BRADFORD | 296 | ICL 1904 | | | | Local government, financial and non-financial work, rates, payroll, stock control, invoicing. |
| KINGSTON UPON-HULL | 296 | ICL 1904 E | | | | Rating, payroll, payment of creditors, costing, stores control. |
| CARDIFF | 289 | ICL 1902 | | | | Payroll, stores accounts, rates accounts, costing and expenditure analyses, payment of invoices, |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

follows TABLE XI.c

COMPUTERS INSTALLED BY SIZE CLASSES IN MUNICIPALITIES WITH MORE THAN 200.000 INHABITANTS

| MUNICIPALITY | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| follows CARDIFF | | | | | | stock control, mortgage payments, selection of jurors etc.; work on bus transport and for City Engineer and Surveyor's Dept. |
| LEICESTER | 283 | ICL SYSTEM 4/30 | | | | General accounting, rents, rates, payroll, payment ledger, income and expenditure analysis, health Department's records, engineering calculations, bills of quantity. |
| STOKE-ON-TRENT | 275 | IBM 360/30 | | | | Payroll, creditors, rates, loans, financial and cost accounts, statistics, project control, net-work, analysis. |
| NEWCASTLE | 251 | ICL 1903 | | | | Payroll, costing, expenditure analyses, creditors, stock control, PERT, highway design, traffic and other planning surveys. |
| PLYMOUTH | 247 | IBM 360/30 | | | | All accounting functions of the local authority, work of other departments. |
| PORTSMOUTH | 219 | IBM 1401 | | | | Payroll, rate billing, accounting, teaching, (Highbury Technical College PORTSMOUTH). |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

follows TABLE XI.c.

COMPUTERS INSTALLED BY SIZE CLASSES IN MUNICIPALITIES WITH MORE THAN 200.000 INHABITANTS

| MUNICIPALITY | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| SOUTHAMPTON | 209 | NCR 315 | | | | Cost records, income and expenditure analysis, payment of invoices, payroll, pensions, rate accounting, quantity surveying, water by meter billing, vaccination and immunisation, bank reconciliation, mortgage interest payments, Southern Regional Examination Board (CSE), traffic analysis, housing rents. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

follows TABLE XI.c.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE LONDON BOROUGHS

| | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| LONDON BOROUGHS: | 7880 | | | | | |
| BARKING | | IBM 360/20 | | | | |
| BARNET | | ICL 1903 | | | | Rates, payroll, payment of creditors, stores ledger, expenditure analysis, library cataloguing electoral registration, bank reconciliation, PERT, traffic survey analysis, engineering design; compiling programs for Hendon College of Technology and BARNET College of Further Education. |
| BRENT AND EALING | | IBM 360/30 | | | | Weekly payroll, rate accounting, payment of creditors, general accounting, time hire, Later: statistics and other work for various departments. |
| BROMLEY | | ICL 1903 | | | | Financial and non-financial work, rates payroll, expenditure, town planning, recovery procedures. |
| CROYDON | | ICL 1902 | | | | Payroll, expenditure and income analysis, stores control and costing, rates and other income, non-financial work. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

follows TABLE XI.c.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE LONDON BOROUGHS

| | INHABITANTS thousand - | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| follows LONDON BOROUGHS | | | | | | |
| CAMDEN | | ICL 1903 | | | | Service to all departments. |
| ENFIELD | | HONEYWELL 200 | | | | Financial and non-financial work. |
| HAMMERSMITH | | HONEYWELL 200 | | | | Payroll, costing, rating, medical records, electoral roll, bills of quantities, library cataloguing. Later: work for all borough departments. |
| HARROW | | ICL KDF 6 | | | | Payroll, rate accounting, mortgage accounts, income and expenditure accounts, job costing, stores ledger, payment of invoices, personal accounts for Housing Act advances, housing rents, sundry debtors, cost control, library index and catalogue, medical records. |
| HOUNSLOW | | IBM 360/30 | | | | Accounting for HOUNSLOW and RICHMOND; vaccination and immunisation records, electoral roll, bills of quantities. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

follows TABLE XI.c.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE LONDON BOROUGHS

| | INHABITANTS thousand - | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| follows LONDON BOROUGHS | | | | | | |
| ISLINGTON | | ICL 1902 | | | | Rates billing and accounting, payroll, financial accounting, cost analyses, stores accounts, creditors' payments, optimum use of Council dwellings, housing rents, health statistics, vaccination and immunisation of children. Later: register of electors, engineering calculations, bills of quantities. |
| LAMBETH | | ICL 1902 | | | | Accounting and financial control, comprehensive management information system, rates, payroll, mortgages, payment of creditors, bank reconciliation, traffic studies, engineering design, town planning. |
| LEWISHAM | | IBM 1401 | | | | Payroll, accounting, and costing, payments to creditors, house purchase scheme, rents, statistics. |
| MERTON | | ICL 1901 | | | | Financial work. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/ DECEMBER 1969

follows TABLE XI.b.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE LONDON BOROUGHS

| | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| follows LONDON BOROUGHS | | | | | | |
| NEWHAM | | ICL 1300 | | | | Payroll, costing, rate billing, payment of creditors, stores accounting, pensions, bank reconciliations, debtors' accounting, mortgage interest warrants. |
| RED BRIDGE | | ICL 803 | | | | Rate accounting, payroll, general accounting, statistics. |
| SUTTON | | ICL SYSTEM 4/30 | | | | |
| WALTHAM FOREST | | ICL 1300 | | | | Payroll, costing, statistics, housing application list. |
| WANDSWORTH | | ICL 1903 | | | | Rates, payroll, salaries, costing and expenditure analysis, income, registration of electors, pensions, payment of creditors. Later: general purpose information system for council's departments. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

follows TABLE XI.c.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE LONDON BOROUGHS

| | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| follows LONDON BOROUGHS | | | | | | |
| LONDON ON BOROUGHS JOINT COMPUTER COMMITTEE | | | ICL LEO III | | | Integrated accountancy, payroll and rates accounting for the LONDON BOROUGHS of BEXLEY, GREENWICH, LEWISHAM and Southwark the Forest Group Hospital Management committee, public libraries' catalogues, critical path analyses, bills of quantities, statistics, general management services, stores records. |
| LONDON BOROUGHS MANAGEMENT SERVICE UNIT, NORTH EAST LONDON COMPUTER CENTRE | | | ICL LEO 360 | | | General accounting and other local authority work for LONDON BOROUGHS of HACKNEY, TOWER HAMLETS and HARINGEY. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

follows TABLE XI.c.

COMPUTERS INSTALLED BY SIZE CLASSES IN MUNICIPALITIES WITH MORE THAN 200.000 INHABITANTS

| MUNICIPALITY | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| NETHERLANDS (1) | | | | | | |
| AMSTERDAM | 857 | ICL 1904 A | | | | |
| ROTTERDAM | 710 | | SIEMENS 4004/45 | | | |
| DEH HAAG | 576 | UNIVAC 1004 | | | | |
| UTRECHT | 274 | BULL/GE G 10 | | | | |
| FRANCE (2) | | | | | | |
| MARSEILLE | 893 | IBM 1401 | | | | |
| LYON | 535 | IBM 360/20 | | | | |
| BORDEAUX | 270 | BULL/GE 150 | | | | |
| STRASBOURG | 254 | BULL/GE 150 | | | | |

SOURCE: (1) S. M. VAN OORSCHOT
(2) O.I. ANNUAIRE GENERAL DE L'INFORMATIQUE 1968

follows TABLE XI.c.3

COMPUTERS INSTALLED BY SIZE CLASSES IN MUNICIPALITIES WITH MORE THAN 200.000 INHABITANTS

| MUNICIPALITY | INHABITANTS thousand - | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| ITALY | | | | | | |
| ROMA | 2.630 | BULL/GE 415<br>2 ELEA 6001<br>UNIVAC SS90 | | | | |
| MILANO | 1.683 | IBM 360/30<br>IBM 1130<br>IBM 1401<br>UNIVAC 1004<br>UNIVAC 418<br>BULL/GE 115<br>BULL/GE 415 | | IBM 360/50 | | |
| TORINO | 1.131 | IBM 1401<br>2 BULL/GE 115 | | | | |
| GENOVA | 845 | IBM 360/25<br>IBM 1460 | | | | |
| BOLOGNA | 485 | BULL/GE 115 | IBM 360/40 | | | |

SOURCE: DIRECT SURVEY

follows TABLE XI.b.

COMPUTERS INSTALLED BY SIZE CLASSES IN MUNICIPALITIES WITH MORE THAN 200.000 INHABITANTS

| MUNICIPALITY | INHABITANTS thousand - | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows ITALY (1) | | | | | | |
| FIRENZE | 455 | UNIVAC 9200<br>IBM 1440 | | | | |
| CATANIA | 406 | IBM 360/20 | | | | |
| TRIESTE | 280 | | | IBM 360/50 | | |
| VERONA | 251 | IBM 360/20 | | | | |
| PADOVA | 221 | UNIVAC 1004 | | | | |
| CAGLIARI | 216 | BULL/GE 115 | | | | |
| GERMANY (2) | | | | | | |
| HAMBURG | 1851 | IBM 360/30 | | | | |
| MUNCHEN | 1231 | | SIEMENS 4004/45 | | | |
| KOLN | 861 | | SIEMENS 4004/45 | | | |

SOURCE: (1) DIRECT SURVEY.
(2) DIRECT SURVEY

follows TABLE XI.c.

COMPUTERS INSTALLED BY SIZE CLASSES IN MUNICIPALITIES WITH MORE THAN 200.000 INHABITANTS

| MUNICIPALITY | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows GERMANY | | | | | | |
| DUSSELDORF | 698 | IBM 360/30<br>SIEMENS 303 | | | | |
| FRANKFURT (MAIN) | 684 | 2 IBM 360/30<br>2 SIEMENS 303 | IBM 360/40 | | | |
| DORTMUND | 657 | IBM 1401 | IBM 360/40 | | | |
| STUTTGART | 630 | IBM 1401 | | | | |
| BREMEN | 598 | IBM 360/30 | | | | |
| HANNOVER | 547 | SIEMENS 303 | | | | |
| DUISBURG | 483 | 2 IBM 360/30<br>SIEMENS 303 | | | | |
| NURNBERG | 472 | SIEMENS 4004/35 | | | | |
| WUPPERTAL | 422 | SIEMENS 303<br>SIEMENS 4004/35 | | | | |
| GELSENKIRCHEN | 367 | IBM 360/30 | | | | |

SOURCE: DIRECT SURVEY

follows TABLE XI.c.

COMPUTERS INSTALLED BY SIZE CLASSES IN MUNICIPALITIES WITH MORE THAN 200.000 INHABITANTS

| MUNICIPALITY | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows GERMANY | | | | | | |
| BOCHUM | 355 | IBM 360/30 | | | | |
| MANNHEIM | 329 | SIEMENS 4004/35 | | | | |
| KARLSRUHE | 255 | IBM 360/30<br>IBM 1401<br>SIEMENS 303 | | | | |
| BRAUNSCHWEIG | 232 | SIEMENS 4004/25 | | | | |
| KASSEL | 214 | IBM 360/20<br>SIEMERS 303 | | | | |
| AUGSBURG | 212 | IBM 360/30 | | | | |

SOURCE: DIRECT SURVEY.

TABLE XI.d.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE COUNTIES

| COUNTY | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| UNITED KINGDOM | | | | | | |
| BEDFORDSHIRE | 433 | HONEYWELL 120 | | | | Income and expenditure accounting, payment of bills, payroll, preparation of drawings, rate demands. |
| BERKSHIRE | 598 | ICL 1902 | | | | Payroll, financial records, rating. |
| BUCKINGHAMSHIRE | 552 | ICL 1903 | | | | Paycoll, payment of creditors, expenditure and income analyses, stores records, highways costing, children's health records, engineering calculation. |
| CAMBRIDGESHIRE | 297 | IBM 360/25 | | | | Payments of creditors, payroll, accounting. Later: integrated management information system. |
| CHESHIRE | 1486 | IBM 1401 | | | | Financial accounting, payroll, engineering calculations, statistical work. |
| | | IBM 360/30<br>IBM 360/20 | IBM 360/40 | | | Financial accounting, payroll, engineering calculations, statistical work, internal planning and contract controll. |
| CORNWALL | 356 | ICL 1902 | | | | Payroll, creditor's payements, expenditure analysis, costing, mortgage dividends, rates, teaching. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

FOLLOWS TABLE XI.d.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE COUNTIES

| COUNTY | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| CUMBERLAND | 296 | ICL 1901 | | | | Payroll, payment of accounts, income/expenditure analysis, costing, stores accounts, engineering calculations. |
| DERBYSHIRE | 882 | IBM 360/30 | | | | Payroll, costing, stores, payment of accounts, ledgers, statistics; highway, structural and allied engineering programs. |
| DEVON | 869 | IBM 360/30 | | | | Accountancy, statistics, technical problems, surveyors department; time hire to City of Exeter; teaching use by Exeter Technical College. |
| DORSET | 338 | ICL 1902 | | | | Payroll, costing, expenditure analysis, stock control; rating, crime statistics, payment of creditors, remittance advices, traffic engineering and surveying calculations, student records, library subject index, health statistics, electoral roll, miscellaneous statistics; time hire to local authorities and DORSET Water Board |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM NOVEMBER/DECEMBER 1969

FOLLOWS TABLE XI.d.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE COUNTIES

| COUNTY | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| DURHAM | 1547 | 2 IBM 360/30 | | | | Accounts, payroll, register of electors, bills of quantities for contract work, stores ordering and control, engineering and architectural stress calculations, medical records. |
| ESSEX | 1269 | | H 2200 | | | Payroll, purchase accounting, expenditure; technical calculations. |
| GLOUCESTERSHIRE | 1062 | ICL 1904 | | | | Register of electors, child and school health records, police statistics, all financial work; time hire for district councils and local industry, payroll, stock control, building procedures, PERT, bills of quantity, highway and structural design, traffic analysis; time hire to GLOUCESTER City, other local authorities and industry. |
| HAMPSHIRE | 1511 | NCR 315 | | | | Payroll, accounting and costing analyses, stock control; creditors, highways costing, bank reconciliations, mortgagees' records, bills of quantity, engineering calculations, electoral register, preparation of rate demands for district |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM NOVEMBER/DECEMBER 1969

FOLLOWS TABLE XI.d.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE COUNTIES

| COUNTY | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| follows HAMPSHIRE | | — | | | | councils, statistics, critical path, techniques, planning, education and health records. Time hire to other local authorities. |
| HEREFORDSHIRE | 140 | ICL 1901 | | | | Financial procedures for County Council, HEREFORD City Council, HEREFORDSHIRE Water Board, and other local authorities in the country. Non-financial procedures including vaccination and immunisation records, registration of electors, engineering calculations, health and education statistics. |
| HERTFORDSHIRE | 881 | NCR 315 | | | | Payroll, income and expenditure control and analysis, payment of creditors, invoicing, bank reconciliation; engineering calculations, bills of quantities, traffic surveys, service work, stores control, highways costing. |
| HUNTINGDONSHIRE AND PETERBOURG | 189 | ICL 1901 | | | | Financial (payroll, accounting statements, stores, bank reconciliations, costing, collection and income.) Later: non-financial applications. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM NOVEMBER/DECEMBER 1969

FOLLOWS TABLE XI.d.

COMPUTERS INSTALLED BY SIZE CLASSES IN THE COUNTIES

| COUNTY | INHABITANTS thousand: | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| KENT | 1345 | ICL 1904 | | | | Payroll, accounting, costing, stores, engineering calculations, quantity surveying, traffic surveys, statistics, PERT, highway design, compiling electoral register, planning, development, health and education statistics. |
| LANCASHIRE | 5198 | ICL 1904 | | | | Accounting, payroll, statistical, and civil engineering calculations, non-financial work for various departments and outside users. |
| LEICESTERSHIRE | 723 | ICL 1902 | | | | Financial, technical calculations, health records, statistical and analysis work, payroll, pensions, stores ledger, costing, quantity surveying. |
| LINCOLNSHIRE | | | | | | |
| - HOLLAND | 105 | ICL 1901 | | | | Financial ledger, invoicing, payroll. |
| - KESTEVEN | 230 | | | | | |
| - LINDSEY | 456 | ICL 1902 | | | | Payroll, payment of creditors, expenditure analysis and costing, statistical and civil engineering calculations, stores ledger, plant loading, electoral rolls, service work. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM NOVEMBER/DECEMBER 1969

FOLLOWS TABLE XI .d.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE COUNTIES

| COUNTY | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| NORTHAMPTONSHIRE | 433 | ICL 1902 | | | | Payroll and accounting procedures; invoicing budgetary control, purchase ledger, stock control, engineering calculations, architectural calculations, health records; outside service work. |
| NORTHUMBERLAND | 828 | IBM 360/30 | | | | |
| NOTTINGHAMSHIRE | 962 | ICL 1301 | | | | Creditors' payments, payroll, costing, accounting, statistics, road accident and crime statistics, engineering calculations, income and expenditure analyses, rate demands. |
| OXFORDSHIRE | 358 | 2 MONROE MONROBOT XI | | | | Payroll, payments, analysis, register of electors engineering calculations. |
| SHROPSHIRE | 326 | IBM 360/30 | | | | Rate demands, accounting, statistical, technical and operational work, accounting work for Borough of Shrewsbury and other public bodies, health records, library cataloguing, bills of quantities, highway design and engineering, further education payments. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM NOVEMBER/DECEMBER 1969

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE COUNTIES

| COUNTY | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| SOMERSET | 644 | ICL 1902 | | | | Payroll, payment of creditors, costing, accounting, civil engineering calculations. |
| STAFFORDSHIRE | 1820 | IBM 360/30 | | | | Payroll remittance advices and cheques, detailed expenditure analysies stores records and costings time hire. |
| SUFFOLK WEST | 155 | ICL 1901 | | | | Financial statistical and non-financial work. |
| SURREY | 985 | ICL 1903 | | | | Financial applications; technical calculations for highways and other departments. |
| SUSSEX EAST | 717 | ICL 1902 | | | | Payroll, highways costing, stores control, local authority accounting, statistical work, traffic survey, engineering calculations. |
| SUSSEX WEST | 455 | | IBM 360/40 | | | Financial records, budgeting and control; payroll and personnel records, rates, creditors, health and education records; architectural and civil engineering design, library book issues. |
| WARWICKSHIRE | 2110 | IBM 360/30 | | | | Financial statistical and technical. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM NOVEMBER/DECEMBER 1969

.. FOLLOWS TABLE XI.d.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE COUNTIES

| COUNTY | INHABITANTS thousand | COMPUTER INSTALLED BY SIZER CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| WIGHT | 98 | BULL/GE G 10 | | | | Income and expenditures analysis, payment of creditors, rate billing, housing advances, payroll stores control; statistical analyses, outside service work. |
| WILTSHIRE | 479 | NCR 315 | | | | Wages and salaries, creditors, financial analyses and control statistics, costing stores, surveyors calculations, health, immunisation records. |
| WORCESTERSHIRE | 669 | ICL 1902 | | | | All financial, payroll and costing work, financial statistical and technical calculations, PERT. |
| YORKSHIRE | | | | | | |
| - EAST RIDING | 544 | ICL 1901 | | | | Payment of creditors, payroll, stores, expenditure analysis, bank reconciliation, engineering calculations, planning statistics. |
| - NORD RIDING | 590 | ICL 1901 | | | | Financial, statistical, engineering and surveying calculations, planning and architectural work. |
| - WEST RIDING | 3782 | HONEYWELL 1250 | HONEYWELL 2200 | | | Payroll, purchase accounting, expenditure, civil engineering calculations, health records. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM NOVEMBER/DECEMBER 1969

FOLLOWS TABLE XI.d.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE COUNTIES

| COUNTY | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| ABERDEEN | 317 | ICL 1301 | | | | Payroll, valuations, rate demands, valuation rolls assessment rolls, remittance advices and cheques, income and expenditure analysis, highways costing, school meal costs, electoral roll, housing rents, mortgage annuities schedules, children statistics; work for NorthEastern Counties Valuation Committee. |
| AYR | 349 | HONEYWELL 200 | | | | Financial, technical applications. |
| DUMFRIES | 87 | 2 NCR 500 | | | | Payroll, book-keeping, costing billing and accountancy work. |
| EAST LOTHIAN | 54 | NCR 500 | | | | Payroll, ledger posting, rates billing, costing, housing loans. |
| FIFE | 323 | ICL 1300 | | | | Costing, payroll, payment of creditors, loan stock interest payments, education and health statistics plant utilisation, financial ledgers, housing rents and rates. Later: stores accounting, valuation and assessment rolls, rates demand notices, valuation schedules. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE COUNTIES

| COUNTY | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| follows FIFE | | ICL 1902 | | | | Costing, payroll, payment of creditors, loan stock, interest payment, plant utilisation, financial ledgers, housing rents and rates, stores accounting, valuation and assessment rolls, rates demand notices, valuation schedules. |
| LANARK | 1563 | IBM 360/30 | | | | Accounting work for engineer's, surveyor's and health departments, picking prospective jurors. |
| MIDLOTHIAN | 590 | IBM 360/20 | | | | Payroll, accounting, rating and valuation, costing, statistics, rents, bursaries. |
| RENFREW | 358 | NCR Century 200 | | | | Local government, financial work. Later: service work for other local authorities. |
| STIRLING | 199 | BULL/GE.G 10 | | | | Payroll, costing, creditor's cheques, financial ledger, purchase analysis. Later: further financial applications. |
| WEST LOTHIAN (1) | 103 | NCR 500 | | | | Payroll, expenditure ledger, payment of creditors, costing, rates billing. |

(1) 2 NCR 50 unclassified

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

FOLLOWS TABLE XI.d.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE COUNTIES

| COUNTY- | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| BRECONSHIRE | 54 | ICL 1901 | | | | |
| CAERNARVON | 119 | ICL 1902 | | | | Local government applications, payroll. |
| CARMARTHENSHIRE | 165 | ICL 1902 | | | | Financial statistical. |
| DEMBIGHSHIRE | 179 | IBM 360/30 | | | | Payment of creditors, payroll, costing, mortgage payments, bank reconcilliation, income and expenditure analysis. |
| FLINTSHIRE | 163 | IBM 360/30 | | | | Financial and non-financial administrative work; technical calculations. |
| GLAMORGANSHIRE | 1255 | ICL 1902<br>ICL 1903 | | | | Payroll, payment of creditors, expenditure analysis costing, stores accounting, non-financial applications, budgetary control, traffic, invoicing, time hire for local authorities. |
| PEMBROKESHIRE | 98 | ICL 1903 | | | | Financial and ancillary work, credit control, accounting, rate demands. |

SOURCE: COMPUTER SURVEY... ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

COMPUTERS INSTALLED BY SIZE CLASSES IN THE COUNTIES

| COUNTY | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| ANTRIM (IRELAND) | | ICL 1901 | | | | Accounting, engineering calculations, education library, health and welfare expenditure, highway design payroll, rates road costing. |

SOURCE: COMPUTER SURVEY: ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

FOLLOWS TABLE XI.d.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE URBAN DISTRICTS

| URBAN DISTRICT | INHABITANTS thousand. | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| UNITED KINGDOM | | | | | | |
| ALDBRIDGE BROWNHILLS DISTRICT | | ICL 1901 | | | | Payroll, rates billing, costing, stores ledger, payment of creditors, bank reconciliation. |
| BANSTEAD URBAN DISTRICT | | NCR 500<br>Philips Data 8000 | | | | Wages, stock purchase, cost centre analysis. Payroll, interest payments, expenditure and income analysis, rent accounting, house loan billing, income and expenditure analysis. |
| BASILDON URBAN DISTRICT | | IBM 360/20 | | | | Financial, statistical and other uses including critical path analysis. |
| BRENTWOOD URBAN DISTRICT | | MONROE MONROBOT XI | | | | Rate and rent accounting, payroll, income and expenditure analysis, job costing, loan and mortgage, repayment accountancy. |
| CARLTON URBAN DISTRICT | | NCR 500 | | | | Payroll, rating, expenditure analysis and other financial and administrative procedures, stores and costing applications, mortgage accounts. |
| CATERHAM & WARLINGHAM URBAN DISTRICT | | NCR 500 | | | | Payroll, rates, housing advances, expenditure, stores. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

FOLLOWS TABLE XI.d.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE URBAN DISTRICTS

| URBAN DISTRICT | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| CHEADLE AND GATLEY URBAN DISTRICT | | ICL 1901 | | | | General accounting, invoicing, payroll, rating, loan interest payments, cash posting. Later: stores accounting (including average pricing), payment of creditors (including cost analysis), rents, housing waiting list, house allocation, medical records, traffic surveys, housing repair programme. |
| CHIGWELL URBAN DISTRICT | | 2 MONROE MONROBOT XI | | | | Rate accounting, payroll, income and expenditure analysis, job costing, stores control, loan and mortgage repayment, accountancy, payment of creditors, register of electors. |
| HEANOR URBAN DISTRICT | | NCR 500 | | | | Payroll, stores, expenditure ledger and rate billing. |
| HINCKLEY URBAN DISTRICT | | UNIVAC 9200 | | | | Rating: expenditure and income analysis; local governement administration; payroll. |
| ILKLEY URBAN DISTRICT | | ICL 1300 | | | | General local government accounting, statistical work. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

FOLLOWS TABLE XI.d.

COMPUTERS INSTALLED BY SIZE CLASSES IN THE URBAN DISTRICTS

| URBAN DISTRICT | INHABITANTS thousand: | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| KETTERING URBAN DISTRICT | | MONROE MONROBOT XI | | | | Payroll, income and expenditure analysis and costing, stores ledger, rate accounting, payment of creditors, loand and mortgage repayment. |
| SHIPLEY URBAN DISTRICT | | NCR 500 | | | | Rate billing, rate ledger, payroll, income and expenditure ledger. |
| THURROCK URBAN DISTRICT | | IBM 360/20 | | | | Local authority financial applications. Later: non financial items. |
| WELLING BOROUGH URBAN DISTRICT | | MONROE MONROBOT XI | | | | Payroll, income and expenditure analysis, rate accounting, stores control, loan and mortgage repayment, payment of creditors. |
| WOKING URBAN DISTRICT | | ICL 1901 | | | | Financial and statistical: accounting, expenditure analysis, rate demands, payroll, stores control. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

FOLLOWS TABLE XI.d.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE RURAL DISTRICTS

| RURAL DISTRICT | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| UNITED KINGDOM | | | | | | |
| AXBRIDGE RURAL DISTRICT | | NCR 500 | | | | Rates accounting, payroll, stores, expenditure analysis; housing advances, general income, sundry debtors, payment of creditors, housing rents. |
| BLABY RURAL DISTRICT | | IBM 360/20 | | | | Rate accounting, payroll, stores accounting, payment of creditors, sundry debtors invoicing, expenditure analysis and general costing, loan and house rental records. |
| CAISTOR RURAL DISTRICT | | NCR 500 | | | | Rating, stores, financial. |
| CHANCTONBURY RURAL DISTRICT | | NCR 500 | | | | Rate billing and accounting, expenditure and income ledger, stores ledger, payroll, payment of creditors. |
| CHRESTERFIELD RURAL DSTRICT | | ICL 1300 | | | | Financial ledger, invoicing, payroll, payment of loans and creditors, housing rents. |
| DONCASTER RURAL DISTRICT | | ICL 1901 | | | | Payroll, costing, expenditure analysis, stock control rating, crime statistics, payment of creditors, remittance advices, traffic engineering and surveying calculations, student records, library subject index, health statistics, electoral roll, |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

FOLLOWS TABLE XI.d.

COMPUTERS INSTALLED BY SIZE CLASSES IN THE RURAL DISTRICTS

| RURAL DISTRICT | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | miscellaneous statistics; time hire to local authorities and DORSET Water Board. |
| HOLYWELL RURAL DISTRICT | | NCR 500 | | | | Payroll, house advances, order on Treasurer, rates. |
| MALLING RURAL DISTRICT | | NCR 500 | | | | Payroll, rate billing, expenditure ledger, rents summary, payment of creditors. |
| NEATH RURAL DISTRICT | | ICL 1901 | | | | With NEATH BOROUGH. PERT, engineering calculations, payroll, remittance advices, bank reconciliation, housing rents, rates, stores. |
| NEW FOREST RURAL DISTRICT LYNDHURST | | NCR 500 | | | | Rating payroll, cheque writing and expenditure ledger, income ledger, housing advances, bonds. |
| RURAL DISTRICT OF RINGWOOD AND FORDINGBRIDGE | | NCR 500 | | | | Payroll, rates billing and collection, payment of creditors, debtors' accounts, rent control, cesspool exhausting. |
| ROTHERDAM RURAL DISTRICT | | NCR 500 | | | | Rate accounting, payroll, expenditure analysis, central purchasing. Later: mortgage advances, loans pool. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

FOLLOWS TABLE XI.d.

COMPUTERS INSTALLED BY SIZE CLASSES IN THE RURAL DISTRICTS

| RURAL DISTRICT | INHABITANTS thousands | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| follows UNITED KINGDOM | | | | | | |
| WATFORD RURAL DISTRICT | | ICL 1901 | | | | |
| WREXHAM RURAL DISTRICT | | ICL 1901 | | | | Financial and statistical. |

SOURCE: COMPUTER SURVEY, ALPHABETICAL LIST OF USERS IN THE UNITED KINGDOM, NOVEMBER/DECEMBER 1969

FOLLOWS TABLE XI.d.

## COMPUTERS INSTALLED BY SIZE CLASSES IN THE "PREFECTURES"

| "PREFECTURES" | INHABITANTS thousand | COMPUTER INSTALLED BY SIZE CLASSES | | | | THE MAIN APPLICATIONS |
|---|---|---|---|---|---|---|
| | | DESK and SMALL | MEDIUM | LARGE | EXTRA LARGE | |
| FRANCE | | | | | | |
| PREFECTURE DE BELFORT | | BULL/GE 150 | | | | |
| " DU CALVADOS | | BULL/GE 150 | | | | |
| " DE L'ISERE | | NCR 395 | | | | |
| " DE LA LOIRE | | BULL/GE 150 | | | | |
| " DE LOIRE ATLANTIQUE | | BULL/GE 150 | | | | |
| " DE PARIS | | 2 IBM 1401 | | | | |
| | | IBM 360/20 | | | | |
| " DE LA REUNION | | BULL/GE 150 | | | | |
| " DU BAS RHIN | | BULL/GE G 10 | | | | |

SOURCE: O.1. ANNUAIRE GENERAL DE L'INFORMATIQUE 1968