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ASSISTANCE TO INDUSTRIAL DATA BANK

DP/NIR/87/018

NIGERIA

Terminal report*

Prepared for the Government of Nigeria
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Fernando J. Vega Catalán,
senior programmer

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United Nations Industrial Development Organization
Vienna

* This document has not been edited.

V.92 53099

I N D E X

1. Development problem and immediate problems attacked.

The purpose of the project is given in the Job Description: "to strengthen the Government's capability to formulate industrial policies to enhance the industrial sector's contribution towards the nation's economic recovery through the establishment of an Industrial Data Bank in the Federal Ministry of Industries' Research and Statistics Division (R & S)"

The duties of the Senior Programmer stated in the Job Description, to be carried out in close co-operation with the National Project Coordinator and the Data Base Specialist, include:

1.1. To translate the organizational outline of Industrial Data Bank and reporting system into program specifications (data input, validation, update block, report generation block, data base query block, data exchange block);

1.2. Design/tabulate listed output and screen displays;

1.3. Design data input formats, implement data input on microcomputers in a pilot operation;

1.4. Design menus for listed output, data input, data exchange, screen displays;

1.5. Select fellows for training abroad;

1.6. Select appropriate training courses;

1.7. Conduct micro-computer training courses for staff at (R & S);

1.8. Evaluate, analyze data of pilot survey using micro-computer spreadsheet software; and

1.9. Prepare a technical report and documentation on the program specifications, input/output formats.

2. Principal results and problems encountered.

2.1 Duties specified in the Job Description.

The team leader decided to carry out by himself, with some inputs from me, the analysis, design and implementation tasks related to the statistical database containing the data obtained from the available surveys, i.e., tasks 1.1, 1.2, 1.3, 1.4 and 1.8.

The team leader and I selected fellows for training and designed appropriate training courses (tasks 1.5 and 1.6). I made the proposal, which was accepted both by UNIDO and the Ministry, of selecting training centers in Nigeria and of our designing courses tailored to the needs of the Data Bank.

2. Principal results and problems encountered.

2.1 Duties specified in the Job Description.

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The team leader and I selected fellows for training and designed appropriate training courses (tasks 1.5 and 1.6). I made the proposal, which was accepted both by UNIDO and the Ministry, of selecting training centers in Nigeria and of our designing courses tailored to the needs of the Data Bank.

On the issue of in-house training (1.7), I conducted the following training programs for IDB staff:

- Database design;
- Systems Analysis;
- dBASE IV Control Center;
- Word processing.

In order to facilitate the understanding of the participants, and for the future reference of other staff that might join later, I produced the following training manuals:

- DOS operating system essentials;
- WordPerfect summary of commands;
- dBASE IV Control Center;
- Basic Structured systems analysis and design techniques.

2.2 Other tasks completed.

Besides, I completed the following reports which I saw as essential components of the project, although they were not implicitly included in the Job Description:

2.2.1 Organizational structure.

I prepared a preliminary proposal for the organizational structure of the Data Bank within the Ministry. It was revised by the project leader and approved by the UNIDO country Director and sent back to the Honorable Minister for his consideration. A more comprehensive report was then prepared, which contained most of my proposals for a final approval. My proposal is contained in Appendix I.

2.2.2 Guidelines for data entry programs.

The paper explains techniques that may be used to improve the quality of the stored data by preventing errors at data entry level and is included in Appendix 2.

2.2.3 Possible outputs of the IDB.

This report studies the sources of primary data and proposes a number of outputs in line with those of UNIDO Data Base in Vienna (Appendix 3).

2.2.4 Data Base Model for Surveys and Censuses.

This paper proposes a model for the Data Bank data base with implementation issues in mind. It is contained in Appendix 4.

2.2.5 The availability of Primary Data.

In my opinion, the main obstacle for the success of the project lies on the availability of current and accurate primary data of a wide coverage. The report in Appendix 5 analyses the problem and suggests solutions. It contains my proposal to a committee initially headed by me to propose to the Ministry that the industrial surveys are conducted by Ministry staff.

2.2.6 Validation of data.

The paper entitled "Improving the Quality of the Industrial Data Bank Information" (Appendix 6) studies possible sources of data, problems related to the primary data of IDB and suggests methods to solve the problems. The paper "Final Screening of Annual Survey Data" (Appendix 7) suggests tests that will detect errors at the primary data and aggregated data levels of the database.

2.2.7 Detailed programs for micro-computer courses.

Appendix 8 contains detailed outlines for courses that could form the basis for the in-house training program conducted by the UNIDO staff of the project for the staff of R & S.

2.2.8 Industrial Information System.

I completed all the stages of the development of an information system based in the Data Bank to provide industrial information for investors, researchers, or government personnel on books, feasibility studies, laws, etc. The program was installed, and the documentation was submitted to the team leader.

2.2.9 Other programs.

Besides the Industrial Information System, I developed the

following programs:

. program for the validation of survey data
. A data entry program (not used)
. A printed output application (not used)

3. **Recommendations.**

Some of my recommendations on technical issues are contained in the Appendixes. Other recommendations are given below.

3.1 Management of the project.

In my opinion, the most important decision to make in respect of the project is the recruitment of a project leader with experience in project management and a sound knowledge and practical experience on current database analysis, design and implementation methodology. Experience of working in Nigeria may be an important asset as well as the capability to work with foreign consultants.

3.2 Revision of the original project objectives.

After the experience accumulated in the recent past and in view of the recent expansion of the Ministry to become the Federal Ministry for Industries and Technology, a revision of the project objectives is recommendable. The Tripartite review may be used to accomplish this.

3.3 Structure of the Data Bank within the Ministry of Industries and Technology.

Approval of the recommendation sent to the Ministry on the new structure or a clear policy to define the position of the IDB within the new Ministry of Industries and Technology is important. At the time I left, the more senior staff attached to the project were still functioning in their previous units and thus were only able to give part attention to the project.

3.4 Staffing.

New professional staff need to be recruited, particularly of computer programmers and statisticians, and especially when the IDB is in full operation.

3.5 Training of Data Bank technical staff and R&S staff.

Training courses for the staff of the R & S Division at large should be organized. Of a special value would be a workshop for the whole Ministry staff to inform them of the possibilities of the IDB

and to make them actual users. The IDB may become more diversified in scope by this interaction.

3.6 Equipment and infrastructure.

I intended to carry out a cost-benefit analysis of the Ministry's minicomputer (an IBM S/36), but could not do it because the data requested was not made available. It is important, nevertheless to carry out such analysis so as to optimize the use of the computing equipment available and to reduce unnecessary expenditure.

Since the equipment acquired by UNIDO for the project consist of stand-alone microcomputers, and the nature of the project makes it advisable to operate in a distributed environment, it is advisable to link the microcomputers in a local area network. I suggest an Ethernet thin cable with a dedicated server Novell Netware 3.11. The necessary LAN versions of the software tools to be used in the network need to be purchased also. A detailed recommendation on this issue is nevertheless required.

Proposed Organogram for the Industrial Data Bank.

Introduction.

According to the project document, the Industrial Data Bank (IDB) is responsible for

- Procuring primary data from nation-wide surveys, and other data sources, and
- Processing these data to provide the information users require.

Thus, two sections are needed for the IDB:

- A Data Collection Section, responsible for the capture of (primary and secondary) data, and
- A Data Processing Section, responsible for the conversion of these data into meaningful information for its users.

What follows is a brief explanation of the blocks in the accompanying functional organogram.

1. The Data Collection Centre:

The objective of this section is threefold:

- Collection and preparation of data from surveys,
- Collection of other secondary data from outside bodies, and
- Collection of data for internal use of the Federal Ministry of Industries (FMI).

The data Collection Centre could then be divided into:

1.1 Survey Co-ordination Section.

The functions of this unit include:

- Design of questionnaires when required.
- Liaising with data-collection centres, such as FOS, IDCs, etc.
- Collection and classification of filled-in questionnaires;
- Editing of questionnaires;
- Coding questionnaires,
- Quality control, etc.

The section is divided into

- The Data Control Section

. The Editing Section and
. The Media Archives Section.

1.1.1. Data Control Section.

This unit is responsible for coordinating with the data collecting bodies in all issues related with the collection of data from the surveys, either conducted by the FOS or by IDB itself.

For a survey conducted by the FOS, the unit will co-ordinate with the FOS in the design of the questionnaire, will co-supervise the survey and collect arrange for the photocopying of the filled-in forms, and bring them to the IDB.

When the survey is organized by the IDB, the unit will design the questionnaires, train or supervise the training of the field staff, co-ordinate with the IDCs in the states, collect the questionnaires, monitor the response, etc.

1.1.2 Editing Section.

This unit is responsible for the editing of the questionnaires, and for the updating of coding tables.

1.1.2.1. Classification and scrutiny.

The task of this unit is to classify the questionnaires and arrange into batches, ready for coding, identifying the wrongly filled questionnaires.

1.1.2.2. Coding.

The information in the questionnaire that is codeable, should be coded by this unit. It is also the responsibility of this unit to compile codes that are standard and up-to-date.

1.1.2.3. Data Review.

The analysis of the survey response should be analyzed by this section with the view of improving the quality of the surveys, present and future.

1.1.3 Media Archives.

This unit is meant to store in an organized and efficient way all the blank forms ready for distribution and filled-in questionnaires and other data sources that have been entered into the computers.

1.2 Other Industrial Data Collection Section.

The data other than from surveys, is gathered by this section.

1.3 Internal Data.

The responsibility of this section is the compilation of internal data within the ministry for the internal computer services, such as salary and personnel information, furniture inventories, etc.

2. Data Processing Section.

The unit that stores and processes the data gathered by the Data Collection Centre is the Data Processing Section, which is responsible for the operations and maintenance of the computer equipment.

2.1. Systems Section.

The functions of this unit include all the stages in the development of applications both for the Internal Data Section and the Industrial Data Section.

2.1.1. Systems Analysis Section.

The systems analysis of applications is carried out by this section, including, systems specification, data flow diagrams, data structure, etc.

2.1.2. Systems Design Section.

The function of this unit is to translate the systems analysis into a detailed plan for implementing the requirements.

2.1.3. Programming Section.

This unit is meant to translate the design into a working system using a suitable programming language.

2.1.4. Testing Section.

This unit is responsible for thoroughly testing the applications to ensure that they are as much free from defects as possible.

2.2. Internal Data Section.

This section will take over the functions of the present Computer Section of the Ministry. Its main function will be the payroll and personnel systems, Library, furniture inventories, etc.

These applications will be designed, implemented and maintained by the IDB personnel.

2.2.1. Payroll.

The function of this unit is to run the Ministry's payroll.

2.2.2. Personnel Information System.

This section be responsible for the updating of the Personnel Information System of the Ministry.

2.2.3 Other applications.

Other internal packages will be added to the ministry and run by different sections.

2.3. Industrial Data Section.

This section will be responsible for

. the development of applications for the IDB and its users.
. The running of the data base, and
. the dissemination of the information produced

2.3.1. Database management Section.

The task of this section is the efficient running of the computerized databases maintained at the IDB.

2.3.1.1. Data Entry.

The data collected and edited by the Survey Co-ordination Section is entered into the computers by the data-entry operators in this unit.

2.3.1.2. Database Maintenance and Update.

2.3.1.3. Queries.

The function of this unit is to translate the users requests into appropriate queries for the database.

2.3.2. Dissemination

The data processed by the IDB has to be brought to users. The function of this section is to disseminate such information. It is divided into the following sections:

- Investment promotion;
- Publications,
- Information Centre,
- Documentation centre.

2.3.2.1. Investment Promotion.

Potential investors that come to collect information from the IDB are attended to by this section. The staff in this section will liaise with the appropriate section of the IDB to obtain the required information.

2.3.2.2. Publications.

Some of the outputs of the IDB will be published in the form of update newsletters, promotion news, directories, etc. This unit is responsible for the preparation of camera-ready materials ready for printing and of liaising with the printer.

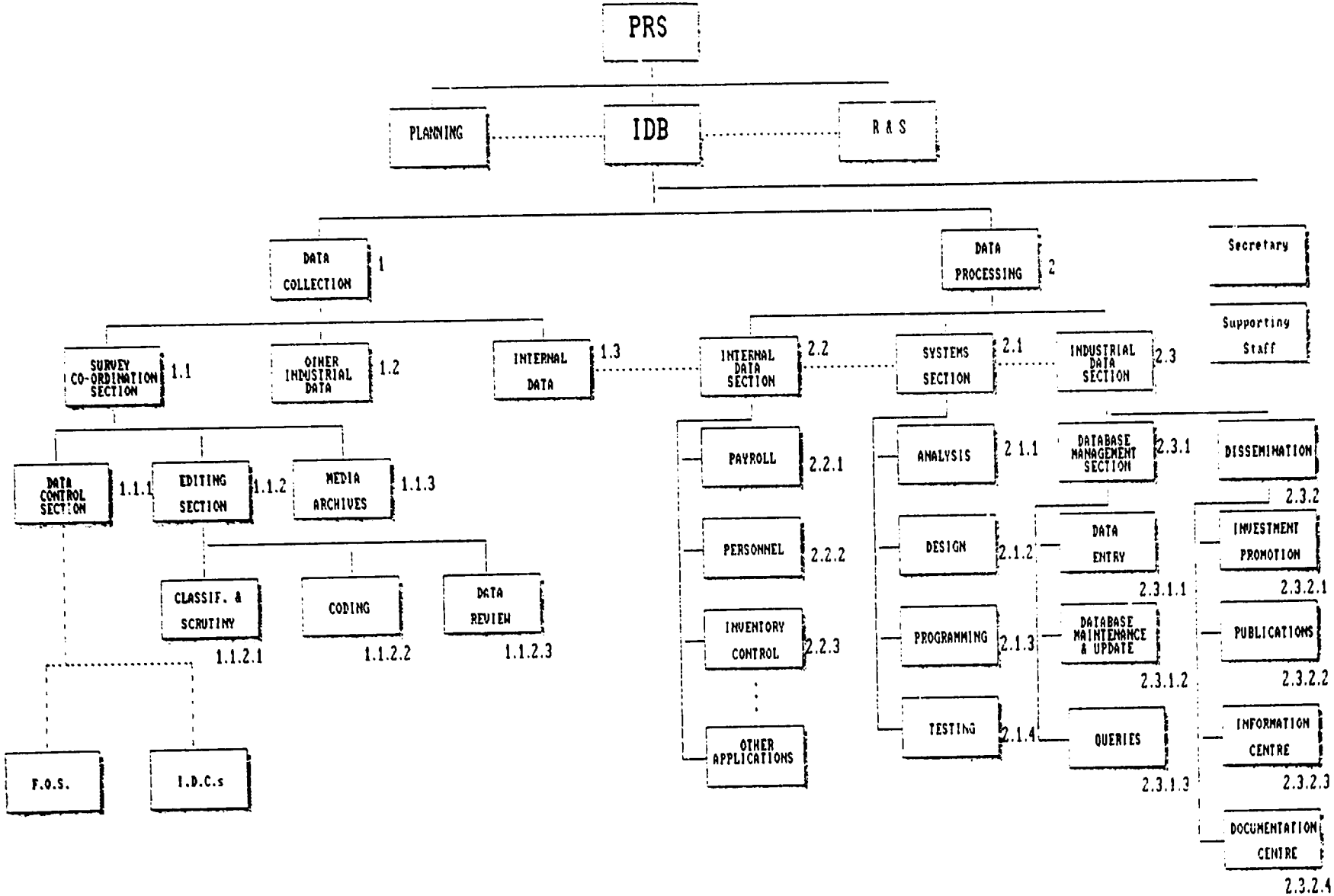
2.3.2.3. Information Centre.

This unit has the function of publicizing the information available at the IDB to users.

2.3.2.4. Documentation Centre.

The section will manage the Library Information System resident in the IDB which aims at supplying technical information from books, feasibility reports, current relevant laws for the industrial sector, relevant newspapers reports, etc.

PROPOSED ORGANOGRAM FOR INDUSTRIAL DATA BANK



APPENDIX 2

Data-Entry program for the IDB

1. Introduction.

The Industrial Data Bank (IDB) will be a repository of large amount of information on the manufacturing industries in Nigeria.

The raw data is currently available from the National Census of Industries and Business (NCIB) conducted by the Federal Office of Statistics (FOS).

A master file will be maintained with all the raw data extracted from forms returned from each Manufacturing Establishment. Enterprises that have more than one establishment at different locations submit separate forms for each establishment.

The IDB will provide statistical information to different users at different levels of aggregation, but not at firm level, since this would violate the Statistics Act.

Needless to mention the importance of keeping a master file as accurate as possible.

The aim of the data-entry program should be to minimize as much as possible the occurrence of errors during the data entry process.

This working paper discusses several ways of achieving this goal. Ultimately, the best error protection comes from entering the raw data twice. This would be advisable if enough data-entry points and operators are available.

This write up attempts to highlight concepts and methods that could be useful not only for the current data contained in the NCIB form, but also for similar data.

2. General Rules.

We now discuss some general concepts on data editing.

2.1 Types of errors in data entry.

Errors caused in the data entry may be of two types: syntax and semantic.

A syntax error is produced when a non-permitted character is

used in a field or attribute of a record. For example, the string ABU$A is a syntax error since no town can have a non-alphabetic character ("$") in it. On the other hand, the string ABWJA would be syntactically correct (all the characters are letters) but semantically incorrect, since no town has that name.

2.2. Cross-validation.

In the process of entering a record, many semantic errors can be avoided by comparing some fields which are syntactically correct when taken individually. For example, in a record in which the fields

no-of-managers = 500 and
no-of-operatives = 5

it's likely to have an error. This can easily be prevented by cross-validating the individual fields during the data entry process. Once the error is detected, the program can be made to signal the operator to reenter the corrected data.

2.3 Design flaws.

A common problem found in databases is redundancy. A field is redundant when it can be deleted without loss of information. For example, the field "total-no-of-workers" is redundant if it is the addition of the fields "no-of-male-workers" and "no-of-female-workers" already present in the record. No information would be lost if the redundant field is deleted, since its value may be readily obtained by adding the other two fields. The removal of redundant fields can save a lot of memory. For example, if a redundant field requires say 15 bytes, and the database has 10,000 records, its removal will save 15 x 10,000 = 150,000 bytes.

2.4. Editing Rules.

The following steps may be followed in the design of a data-entry program:

2.4.1. Edit known before unknown, i.e., allow the operator to correct or cancel an entry when he/she has become aware of the error. For example, the entry

ABYJA [cancel]

should be ignored.

2.4.2. Edit syntactic before semantic, i.e., check data format before checking its sense. For example, there is no point in cross-validating the town "ABU$A" since it is not syntactically correct. The entry "ABWJA" should be cross-validated.

2.4.3. Edit single fields before cross-validating, i.e., cross-validate only the fields that are individually syntactically correct. For example, the fields

no-of-managers =500 and
no-of-operatives =50

should be cross-validated, while the fields

no-of-managers =50 and
no-of-operatives = 10,000,000

should not, since one of the last entry is not semantically correct (no Establishment in Nigeria can possibly have 10 million workers).

2.4.4. Edit internal before external, i.e., carry out every possible check on a record before using it at all.

2.4.5. Seek advice from experts on the nature of the data.

In order to effectively avoid semantic errors adequate criteria should be obtained. Some of these criteria could be found by carefully examining the raw data. For example, by sampling questionnaires one may find that no company has more than 1300 workers. The data entry program can then use this fact to flag as erroneous any value which exceeds this figure.

Specialists in the area dealt with by the questionnaires may often be able to provide useful relationships among the data attributes which can be used into building effective validation criteria. They should then be involved in the process of designing the data entry program.

2.4.6. Validating elements of a set

The data entry program could validate fields for which there exist a finite and not very large number of possible values, by keeping a file with all the possible values the field can take, and then checking if the new value is on the set. For example, if one of the fields is "town", a file with all the towns can be kept. The program should try to find every new value entered. If the value is not found, then either the entry is rejected, or the user is asked if the new value is to be added to the file.

3. The NCIB form for 1987.

We can now apply some of the concepts described above to the NCIB. form.

3.1. Software considerations.

Every language or package stores data in its own format. The

software to use in the implementation of the data entry program should be able to create a master file in a format which can easily interface (communicate) with other applications which may use the master file. Generally, ASCII text files can be read by most languages and packages.

Besides, the software should make the process of creating, deleting and editing records as easy and as flexible as possible.

dBASE is a generally accepted standard Data Base Management System (DBMS) in the microcomputer environment. It possesses a powerful set of functions and commands, as well as useful debugging tools which greatly facilitates the implementation stage of system development. dBASE has become so popular that there are several languages which are virtually dBASE compatible, such as Fox Base, Clipper, etc.

dBASE has the capability of creating an ASCII version of a database. It would therefore be advisable to use for the current program.

3.2 Screen displays.

In order to simplify the task of the data entry operators, as well as to minimize the errors, the program could be designed in such a way that the dialogue with the user be made by means of frames close to the actual format of the sections or subsections of the actual forms.

Several data items consist of boxes, one or more of which are filled in the form. dBASE can easily reproduce such boxes, since it has superb screen management tools.

In the case where only one out of several boxes is ticked, the cross validation is easily achieved by simply making the program count the number of boxes ticked. Ticking a box can be simulated by entering a character, "x" for example, in the box displayed on the screen.

In several sections, further information is to be entered when certain boxes are ticked. The request for such information should only be displayed when the corresponding box is ticked. Again, this requires little coding in dBASE.

Fernando J. Vega Catalán
December 12, 1990

APPENDIX 3

Possible outputs of the IDB

Introduction.

The success of the IDB will be a function of the quality of the outputs made available to its users. Besides the *ad hoc* queries, expected from specialized users, the Dissemination Unit of the IDB may periodically produce outputs for a wide audience, both local and international. Some of the outputs suggested in this paper may be generated as standard publications (for example, in Newsletter format) or by means of user-friendly off-line databases, easily distributed in the form of diskettes to users with microcomputers.

Sources of data.

Some of the outputs may be extracted from industrial surveys and censuses data already held at the IDB, as well as from external sources such as the Central Bank of Nigeria, Customs and Excise, Federal Office of Statistics, etc. The IDB may also request from the UNIDO Database in Vienna for all the data they have about Nigeria. The UDB distributes the data in machine-readable form. Other possible sources include the **Yearbook of Industrial Statistics**, published by the UNSO, as well as published reports on Nigeria from the World Bank, OEDC, EUROSTAT, ILO, FAO and data compiled by the United Nations regional commissions.

Another interesting source of data is Global-Stats Ltd., a firm that distributes off-line databases of developing countries on Economic, Finance and Trade, and World Commodity prices and indexes (a price list of this service is attached).

Outputs.

The outputs included in this report are inspired in those generated by the UNIDO Database (UDB) in Vienna. The list is not meant to be exhaustive. Whenever indexes or constant prices are computed, they refer to a year for which data is available and which is, as much as possible, a stable. The breakdown by branches may be at the 3-digit or 4-digit ISIC level.

1. Annual growth of the Manufacturing Value Added (MVA) at current, at constant prices (using a suitable reference year) and in percentage.

2. Share of MVA in GDP (%) for the available years.

3. Structure of MVA by industries at current and at constant prices for the available years.

4. Annual growth of VA by branches at current prices and at constant prices.

5. Selected indicators (including Value Added (VA)/Employee (1,000 $/₦) [a], Wages/Employee (1,000 $/₦) [b], VA in output (%), Wages in Value Added (%) [a/b x 100]) of industries at current prices for all the years, in Naira and in US $.

6. Annual growth of trade in manufactures at current prices for available years (%).

7. Share of trade in manufactures in total commodity trade at current prices and percentage.

8. Selected indicators of trade in manufactures by R&D intensity at current prices for the available years. Manufactures may be classified as High, Medium, or Low R&D products. The indicators are the following:

    1. Share in total manufactures exports (%)
    2. Share in total manufactures Imports (%)
    3. Ratio of net exports to total trade
    4. Export Index
    5. Import Index

9. Selected indicators of trade in manufactures by end-use, at current prices for the available years. Products are classified into semi-processed and processed. The total may also given. The indicators include:

    1. Share in total manufactures exports (%)
    2. Share in total manufactures imports (%)
    3. Ratio of net exports to total trade (%)
    4. Export Index
    5. Import Index

10. Structure of the Industrial Sector (%) for the available years by branches using the following indicators: share of the MVA, share in total employment, share in total VA, share in total employment.

11. Annual growth rate of production by branch at constant prices.

12. Selected indicators for Trade in Manufactures, at current prices, for the available years, including the following ratios:

    1. Exports to GDP.
    2. Imports to GDP.
    3. Manufactures exports to total exports.
    4. Manufactures exports to manufactures production.

5. Manufactures imports to consumption of manufactures.
6. Exports of capital goods to production of capital goods.
7. Imports of capital goods to production of capital goods.
8. Imports of industrial equipment to production of capital goods.
9. Imports of capital goods to fixed capital formation.
10. Imports of intermediate goods to total production.

13. Selected indicators of trade in manufactures (divided into semi-processed and processed products, and by R&D intensity).

Semi-processed may be divided into

Food
Petroleum products, and
Supplies and intermediates.

The processed products may be divided into

Supplies and Intermediates
Non Durable
Industrial Equipment and other Equipment.

The division according to R&D intensity may be as

High R&D,
Medium R&D, and
Low R&D.

The indicators are:

1. Exports,

   a. Value ($ m)
   b. Per capita value ($).
   c. Share in country exports (%).
   d. Growth rate (%).

2. Imports,

   a. Value ($m)
   b. Per capita value ($)
   c. Share in country imports (%)
   d. Growth rate (%).

14. Selected indicators of trade in manufactures by product group using the ISTC classification at current prices for the available years (%). The indicators are:

1. Growth rates of imports.
2. Growth rates of exports.
3. Share in total manufacture of imports.

4. Share in total manufacture of exports.

15. Industrial-chemical and Basic-metal intensities (divided into iron & steel and non-ferrous metals) at current prices, for the available years.

16. Ratio of the cost of purchased fuels and electricity to VA by industrial branch, at current prices for the available years (%).

17. Share of female employees in total employment by industry for the available years (%).

18. Selected indicators of demand-supply relations by branch at current prices, for the available years. The indicators are,

1. Output to apparent consumption
2. Imports to apparent consumption
3. Imports from developed countries to apparent consumption.
4. Exports to output.
5. Exports to developed countries to output
6. Net exports to total supply

APPENDIX 4

Data Base Model for Surveys and Censuses

Introduction.

Primary data for Surveys and Censuses consists of a (somewhat) fixed part (the establishment identification items, such as name, year established, etc.) which are not expected to change, and the annual information which vary from year to year. Besides, since the questionnaires are changed from time to time, some data items may only be available for certain years. Adopting a fixed structure may lead to loss of information and inefficient design.

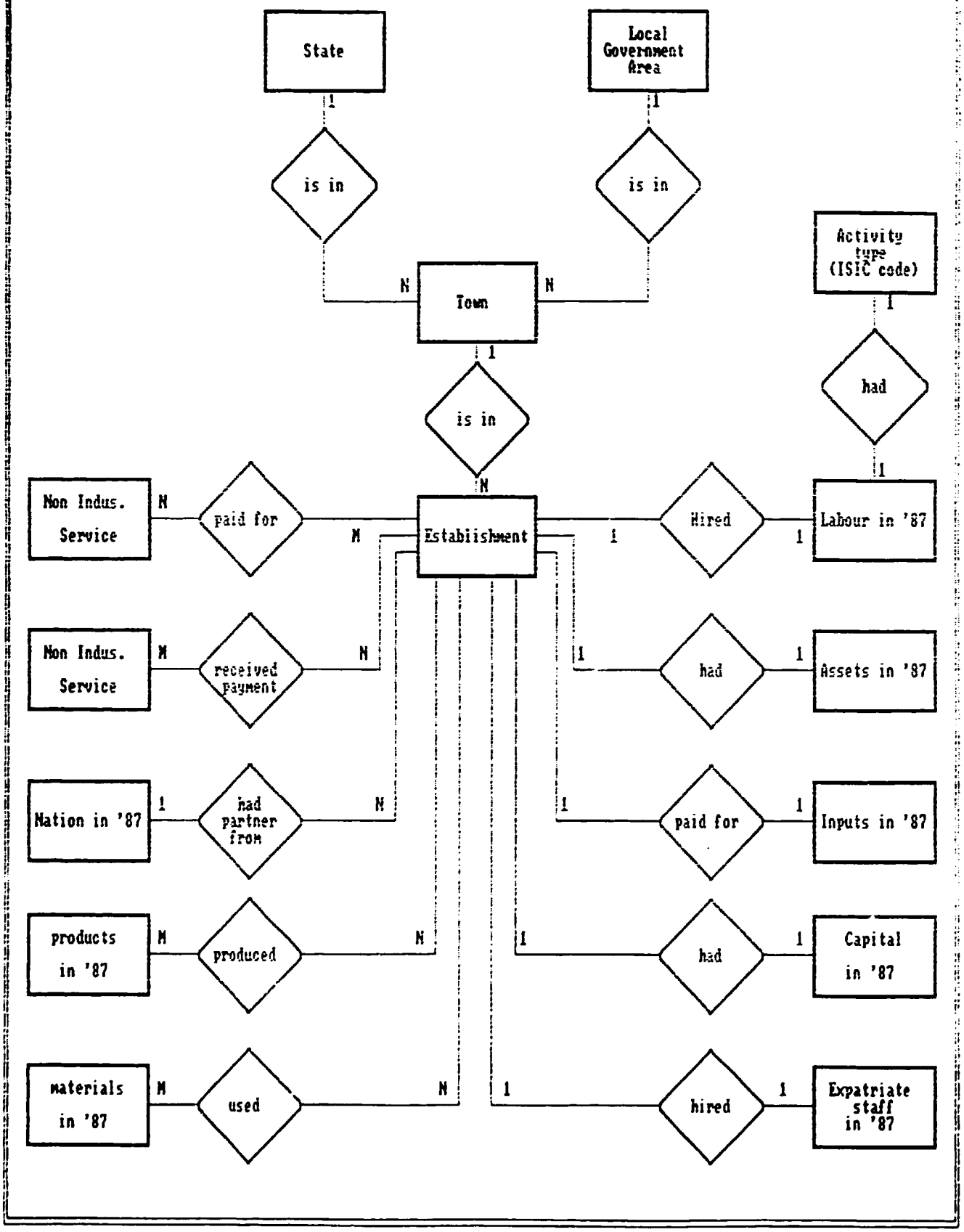
A possible alternative consists of creating an object "Establishment" (the physical name is ESTAB, below) which is related to other objects. These relationships may be 1-to-1 (1:1), 1-to-many (1:N) or many-to-many (N:M). The proposed Information Structure Diagram, which consists of an overall Entity Relationship Diagram (ERD) for the 1987 Census is shown in Fig. 1. This Figure shows the objects (represented by boxes) and their relationships (represented by diamond shapes), indicating also the type of relationship that exists between the objects.

The Information Structure Diagram for another year will be similar, although consisting of more or less objects, and these objects possibly having different attributes. For example, the 1985 questionnaire does not make provision for the "nationality of the main foreign partner" which is contained in the 1987 Census. Consequently, the 1985 diagram will not contain the object "Nation", which is part of the 1987 ERD.

The objects in the model (represented by tables), have been normalised by ensuring that,

- Each instance of an object has only one value for each of its attributes;
- There are no "holes", i.e., there is no "non applicable" value assigned to a data item;
- The attributes have no structure, i.e., they are "atomic" or indivisible.

data model for the 1987 Census



Details of the ERD: specification of objects.

In the following sections details of the different objects and their relationships are given. Referential[1] attributes, linking ESTAB to other tables, are underlined in all the lists of attributes that follow. We use the dBASE convention in naming the data types: N (Numeric), C (Character), L (Logical) and D (Date).

1. The Establishment object.

The object "establishment" is the central piece to which all the other objects are directly or indirectly related. It is also common to data objects from different years. The attributes are listed in the table ESTAB. These attributes are fixed data items regarding the manufacturing establishment.

ATTRIBUTES FOR ESTAB. The object contains as attributes permanent features of the manufacturing establishment.

Field	Field Name	Type	Width	Description
1	SERIAL_NO	N	8	Key field. It is a serial number to identify the establishment throughout the years
2	NAME	C	28	Establishment name
3	TOWN_FACT	C	4	Town code of Factory. This identifier links ESTAB with the State and Local Government Area tables (STATE85 and LGA85 in this case).
4	ADDR_FACT1	C	20	Factory address (Street and Number) line 1
5	ADDR_FACT2	C	20	Factory address (Street and Number) line 2
6	TEL_FACT	C	11	Factory Telephone
7	TOWN_MAIL	C	4	Town code of Mailing Address
8	ADDR_MAIL1	C	20	Mailing Address (line 1)
9	ADDR_MAIL2	C	20	Mailing Address (line 2)
10	TELE_POBOX	C	11	Telephone or P.O. Box
11	EC_TYPE	N	1	Type of Economic Establishment (as in ESTAB form) 1: Single establishment 2: Head office 3: Establishment owned by another
12	OWNERSHIP	N	1	Type of Ownership/Legal organization 1: Sole proprietorship 2: Partnership 3: Priv. Ltd. Company 4: Public Ltd. Company 5: Co-operative 6: Statutory corporation (parastatal)

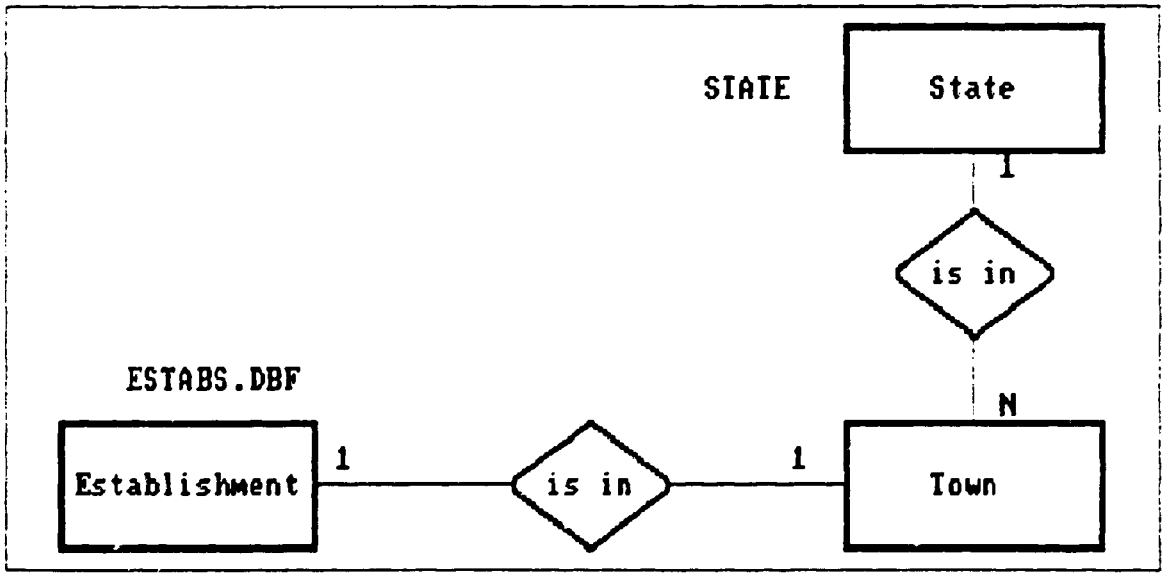
[1]Attribute that tie an instance of an object to an instance of another object

7: Government owned
8: Other

13	WHEN_EST	D	8	Date establishment started operation
14	CONTCT_PER	C	36	Name of contact person
15	CONTCT_ADR	C	44	Address of contact person
16	CONTCT_TEL	C	11	telephone of contact person
Total **			248	

2. Modelling the Location (State and Local Government Area) of establishment.

There have been several changes involving the States of the Federation, and more may be expected. But while the State of a given establishment may vary due to the changes mentioned above, the name of the town continues the same. The name of the town may be considered as an attribute of the object Establishment which is linked to the State object STATE85. Every time that the State structure of the Federation changes, a new State object is created. If the State is made an attribute of Establishment, every time that there is a change in the States, that attribute would have to be modified. But with the present structure, shown in Fig. 2, there is no need for such changes. The creation of new states will only require an extra table. The same argument applies to the Local Government areas represented by the object LGA85.



ATTRIBUTES FOR STATE85. The record contains the names of the states in Nigeria (FOS) from 1985 until 1991 and the name of the towns it has. This file is linked to ESTAB by TOWN_NAME (TOWN_FACT in ESTAB).

Field	Field Name	Type	Width	Description
1	STATE_NAME	C	20	State name
2	TOWN_NAME	C	20	Town name
** Total **			41	

The ERD for the Establishment-Local Government Area relationship is similar to that of the State, and is shown in Fig. 3.

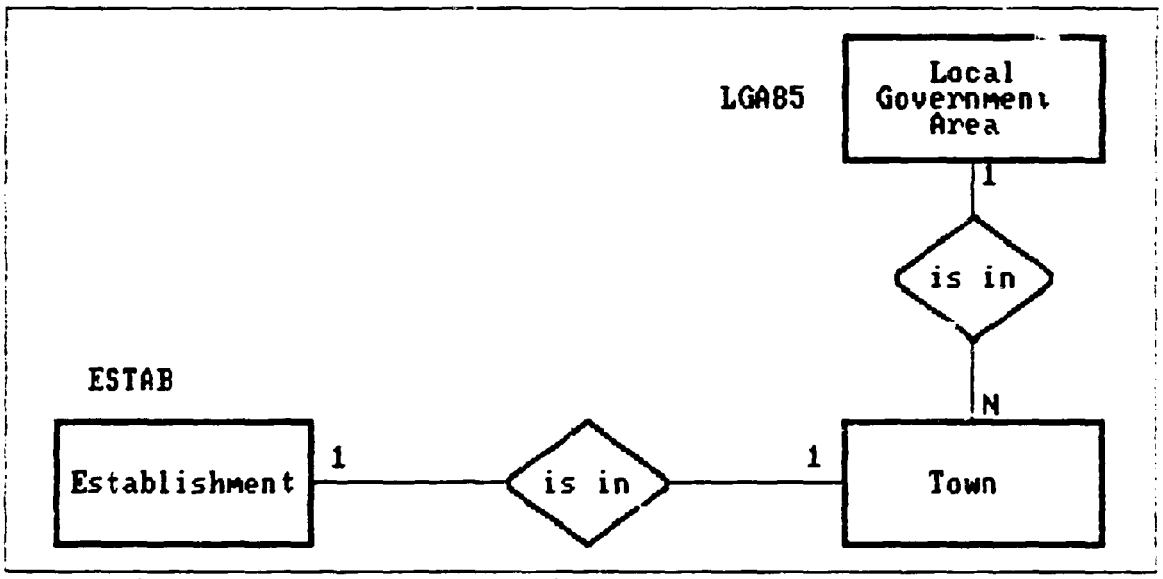


Figure 3ERD for the Establishment-Local Government Area relationship.

ATTRIBUTES FOR LGA85. The record contains the names of the Local Government Areas from 1985 until 1991, and the name of the towns it has. Like STATE85, LGA85 is linked to ESTAB by the referential attribute TOWN_NAME.

Field	Field Name	Type	Width	Description
1	LGA_NAME	C	20	LGA name
2	TOWN_NAME	C	20	Town name
** Total **			41	

3. Specification of the Labour hired in 1987.

The Labour hired by an establishment in terms of numbers and remuneration of different types of employees for a given year ('87 in this case), may be considered as an object (LABOUR87) related to the Establishment object. The relationship is one-to-one if only one year is considered, and one-to-many if several years are considered (See Fig. 4). The same reasoning applies to the Establishment's assets, material inputs, capital, etc.

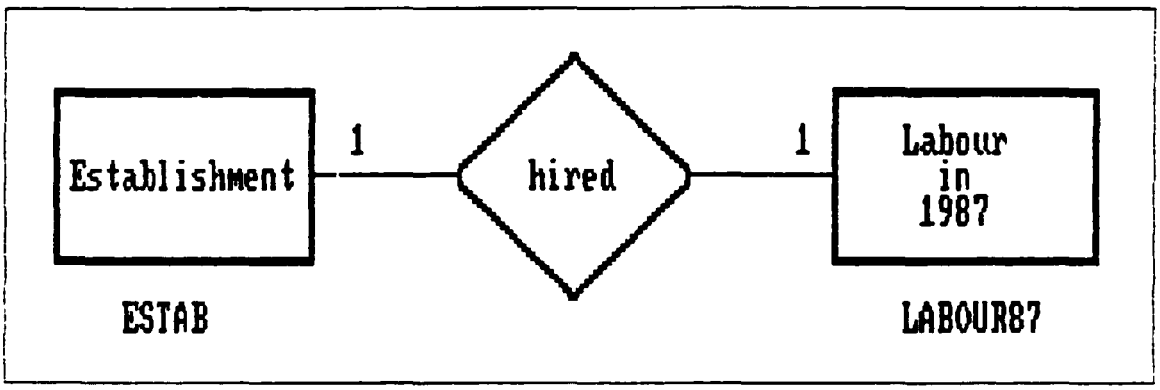


Figure 4ERD to model the Local Labour for the year 1987 hired by Establishment.

LABOUR87 table containing information related to labour in 1987. It is linked to ESTAB by the referential *(foreign)* key SERIAL_NO which is an identifier for the ESTAB table.

Field	Field Name	Type	Width	Description
1	SERIAL_NO	N	8	Same SERIAL_NO as in ESTAB file
2	ACTIVITY	N	4	Four-digit ISIC code
3	OP_PERIOD	N	2	Period of operation during 1987
4	WHY_NOP	N	1	Reason for no operation 1: New business 2: Seasonal break 3: Legal closure 4: Change of ownership 5: Industrial action 6: No longer in existence 7: Other
5	NO_PRO_MAL	N	5	No. of male working proprietors
6	NO_PRO_FEM	N	5	No. of female working proprietors
7	NO_APP_MAL	N	5	No. of male apprentices
8	NO_APP_FEM	N	5	No. of female apprentices
9	NO_MNG_MAL	N	2	No. of male managers/technical workers

10	NO_MNG_FEM	N	2	No. of female managers/technical workers
11	NO_CLK_MAL	N	3	No. of male clerical and office staff
12	NO_CLK_FEM	N	3	No. of female clerical and office staff
13	NO_OPE_MAL	N	5	No. of male operatives
14	NO_OPE_FEM	N	5	No. of female operatives
15	NO_OTH_MAL	N	3	No. of male others
16	NO_OTH_FEM	N	3	No. of female others
17	SAL_PRO	N	9	Salaries/wages of professional staff
18	SAL_CLK	N	9	Salaries/wages of clerical staff
19	SAL_OPE	N	9	Salaries/wages of operatives
20	BEN_PRO	N	8	benefits of professional staff
21	BEN_CLK	N	8	benefits of clerical staff
22	BEN_OPE	N	8	benefits of operatives
23	NO_TRA_ITJ	N	5	No. trained in the job
24	NO_TRA_EXN	N	5	No. trained in external courses in Nigeria
25	NO_TRA_EXA	N	5	No. trained in external courses in abroad
26	TOT_TRAIN	N	9	Total expenditure in training
27	OP_TIME_HR	N	6	Man-hours worked in June 1987
28	OP_TIME_DY	N	2	Days worked in June 1987

** Total **			145	

4. The Industrial Activity Classification of the Establishment.

Since the type of industrial activity of an establishment, identified by its ISIC 4-digit code, may vary from year to year, it can not be made an attribute of the Establishment (ESTAB table), since this object represents the permanent features of the manufacturing unit. Nevertheless, it can be absorbed into the object LABOUR87, and thus allowed to change from year to year. The ACTIVITY attribute of LABOUR87 can then be linked to the table ISIC containing the ISIC codes (4-digit) for the different industrial branches. The ERD is shown in Fig. 5.

ATTRIBUTES FOR ISIC. This table contains the codes and full name of the industrial branches (4-digit) and their description. It is linked to the LABOUR87 table.

Field	Field Name	Type	Width	Description
1	ACTIVITY	N	4	ISIC code (field no. 4 of ESTAB)
2	INDUSTRY	C	45	Full description.

** Total **			50	

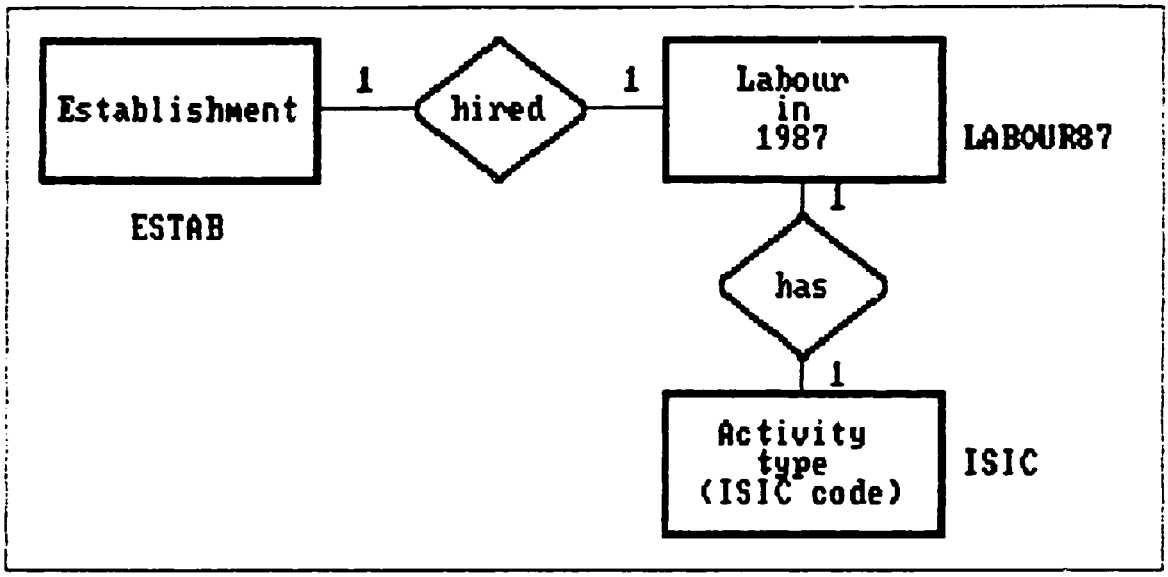
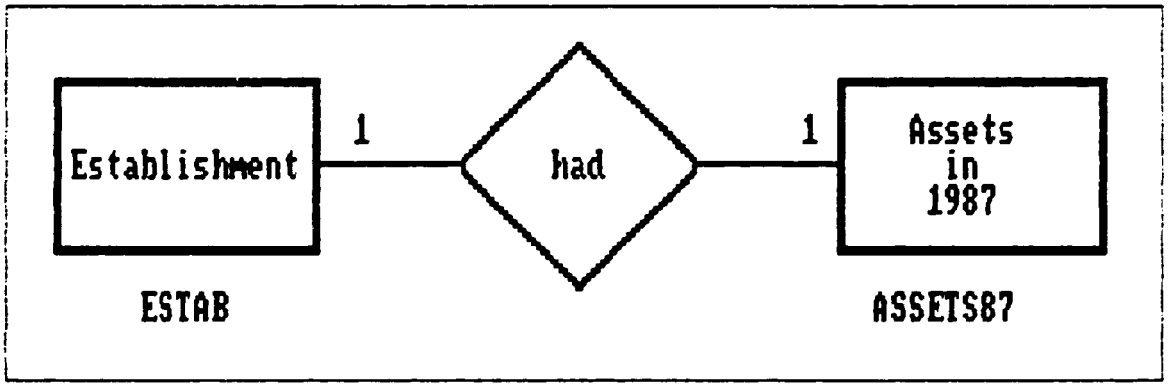


Figure 5ERD for assigning a ISIC code to Establishment in 1987.

5. Modelling the establishment's assets.

Figure 6 shows the ERD for the establishment-assets '87 relationship. It is similar to the establishment-labour '87 ERD. The object is called ASSETS87.



ATTRIBUTES FOR ASSETS87: stocks in January and December '87 and addition to fixed assets during '87.

Field	Field Name	Type	Width	Description
1	SERIAL_NO	N	8	Same SERIAL_NO as in ESTAB file
2	STK_MAT_JA	N	9	Stock of materials in January
3	STK_MAT_DE	N	9	Stock of materials in December
4	STK_WIP_JA	N	9	Stock of Work-in-progress in January
5	STK_WIP_DE	N	9	Stock of Work-in-progress in December
6	STK_FIG_JA	N	9	Stock of finished goods in January

7	STK_FIG_DE	N	9	Stock of finished goods in December
8	STK_GFR_JA	N	9	Stock of goods bought for resale in January
9	STK_GFR_DE	N	9	Stock of goods bought for resale in December
10	NFA_RESBUI	N	9	New fixed assets in residential building
11	NFA_NONRES	N	9	New fixed assets non residential
12	NFA_OTHCON	N	9	New fixed assets in other construction
13	NFA_LAND	N	9	New fixed assets in land
14	NFA_MACHEQ	N	9	New fixed assets in machinery and equipment
15	NFA_TRANEQ	N	9	New fixed assets in transport equip.
16	S_H_RESBUI	N	9	Second-hand assets in residential building
17	S_H_NONRES	N	9	Second-hand assets non residential
18	S_H_OTHCON	N	9	Second-hand assets in other construction
19	S_H_LAND	N	9	Second-hand assets in land
20	S_H_MACHEQ	N	9	Second-hand assets in machinery and equipment
21	S_H_TRANEQ	N	9	Second-hand assets in transport equip.
22	ARI_RESBUI	N	9	Cost of alterations,renovations and improv. in residential building
23	ARI_NONRES	N	9	Cost of alterations,renovations and improv. non residential
24	ARI_OTHCON	N	9	Cost of alterations,renovations and improv. in other construction
25	ARI_LAND	N	9	Cost of alterations,renovations and improv. in land
26	ARI_MACHEQ	N	9	Cost of alterations,renovations and improv. in machinery and equipment
27	ARI_TRANEQ	N	9	Cost of alterations,renovations and improv. in transport equip.
28	W_D_RESBUI	N	9	Cost of work done on own account in residential building
29	W_D_NONRES	N	9	Cost of work done on own account non residential
30	W_D_OTHCON	N	9	Cost of work done on own account in other construction
31	W_D_LAND	N	9	Cost of work done on own account in land
32	W_D_MACHEQ	N	9	Cost of work done on own account in machinery and equipment
33	W_D_TRANEQ	N	9	Cost of work done on own account in transport equip.
34	SFA_RESBUI	N	9	Value of sales of fixed assets in residential building
35	SFA_NONRES	N	9	Value of sales of fixed assets non residential
36	SFA_OTHCON	N	9	Value of sales of fixed assets in other construction
37	SFA_LAND	N	9	Value of sales of fixed assets in land
38	SFA_MACHEQ	N	9	Value of sales of fixed assets in machinery and equipment
39	SFA_TRANEQ	N	9	Value of sales of fixed assets in transport equip.

	** Total **		351	

6. Material Inputs.

The material inputs used by the establishment in 1987 are represented in Fig. 7. The object is called INPUTS87. The ERD is similar to the establishment-labour diagram.

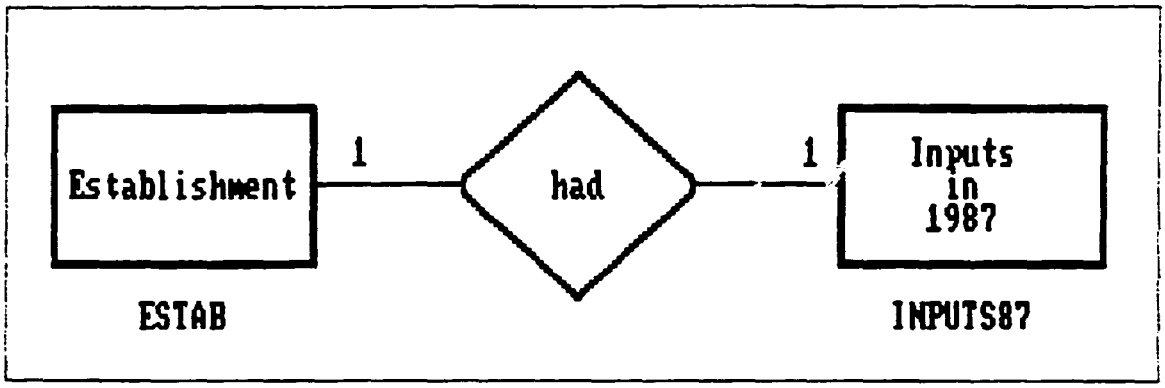


Figure 7ERD to model the material inputs to the Establishment in 1987.

ATTRIBUTES FOR INPUTS87: materials, supplies, fuels, electricity, etc. during 1987.

Field	Field Name	Type	Width	Description
1	SERIAL_NO	N	8	Same SERIAL_NO as in ESTAB file
2	COST_MAT	N	9	Cost of materials
3	COST_FUELS	N	9	Cost of fuels
4	COST_ELEC	N	9	Cost of electricity
5	COST_CTR	N	9	Cost of contract and commission work done by others
6	COST_REP	N	9	Cost of repairs and maintenance
7	COST_GOODS	N	9	Cost of goods bought for resale
8	COST_OTH	N	9	Other operating expenses
9	KWH_PUR	N	8	Kwh of electricity purchased
10	KWH_GEN	N	8	Kwh of electricity generated
11	ELEC_GEN	N	9	Cost of electricity generated
12	KWH_SOLD	N	8	Kwh of electricity sold
13	ELEC_SOLD	N	9	Value of electricity sold
14	KWH_CONS	N	8	Kwh of electricity consumed
15	ELEC_CONS	N	9	Value of electricity consumed
16	SLE_PRO	N	9	Value of sales of products
17	REC_CON	N	9	Receipts for contract work for others done on their materials
18	REC_REP	N	9	Receipts for repairs and installation
19	REC_OTH	N	9	Other receipts for industrial services including the sale of scraps, etc.

20	SLE_GOODS	N	9	Sale of goods bought and sold in the same condition as purchased
21	VAL_ASS	N	9	Value of assets produced by own employees for capital account
22	ELEC_NEPA	N	9	Cost of electricity
23	ELEC_GENER	N	9	Electricity generated
24	ELEC_OTH	N	9	Other electricity
25	WATR_SOURC	N	1	Type of water source: 1: Public water supply 2: Borehole 3: Water tanker 4: Other
26	INDUS_WSTE	N	1	Mode of disposal of industrial waste: 1: In-house incineration 2: Local refuse dumping area 3: Waterways/rivers 4: Chemical treatment/conversion 5: Other
27	PROBLEM	C	20	List of problems in order of priority AABBCCDDEEFFGGHHIIJJ
	** Total **		233	

7. Capital Structure of the establishment in '87.

The details on the establishment's capital for a given year may be modelled just like labour. The object is called CAPITL87. The ERD is shown in Fig. 8.

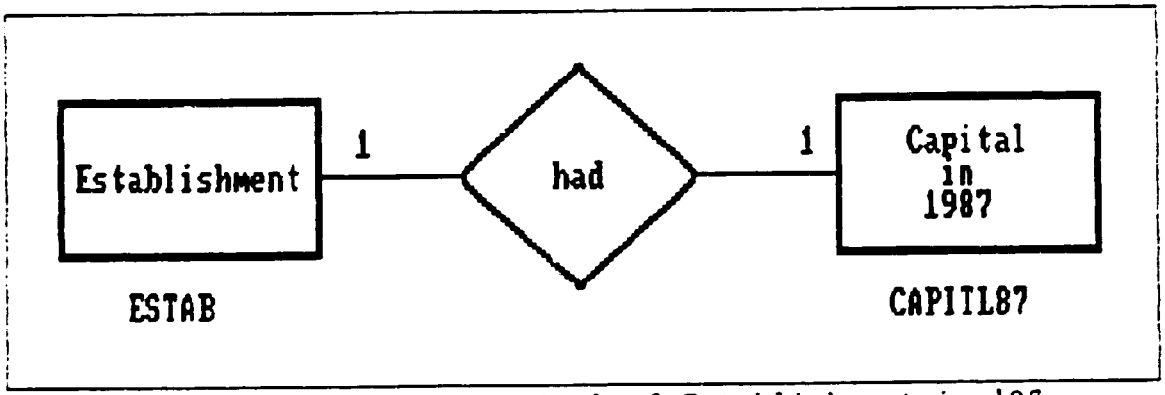


Figure 8ERD modelling the capital of Establishment in '87.

ATTRIBUTES FOR CAPITL87: Paid-up capital and sources of loans for 1987

Field	Field Name	Type	Width	Description
1	SERIAL_NO	N	8	Same SERIAL_NO as in ESTAB file
2	AUTHO_CAP	N	9	Authorised capital as at 31 Dec '87
3	CAP_NIG	N	9	Private Nigerian capital
4	CAP_NNIG	N	9	Private non nigerian capital
5	FED_GOV	N	9	Federal Government capital
6	STA_GOV	N	9	State government capital
7	CAP_OTH	N	9	Other Capital
8	BNK_LOAN	N	9	Direct bank loan
9	GOVG_LOAN	N	9	Government guaranteed bank loan
10	COOP_LOAN	N	9	Co-operative society loan
11	FAM_LOAN	N	9	Family/friends loan
12	OTH_LOAN	N	9	Other loans

	** Total **		108	

8. Expatriate Staff.

While all establishments need local labour, very few of them will need expatriate staff. The relationship between the objects Establishment and Expatriate Labour in '87 is 1:1 but conditional. It is therefore advisable to create a new object (EXPAT87) different from Local Labour (LABOUR87) in order to minimise space. The ERD is shown in Fig. 9.

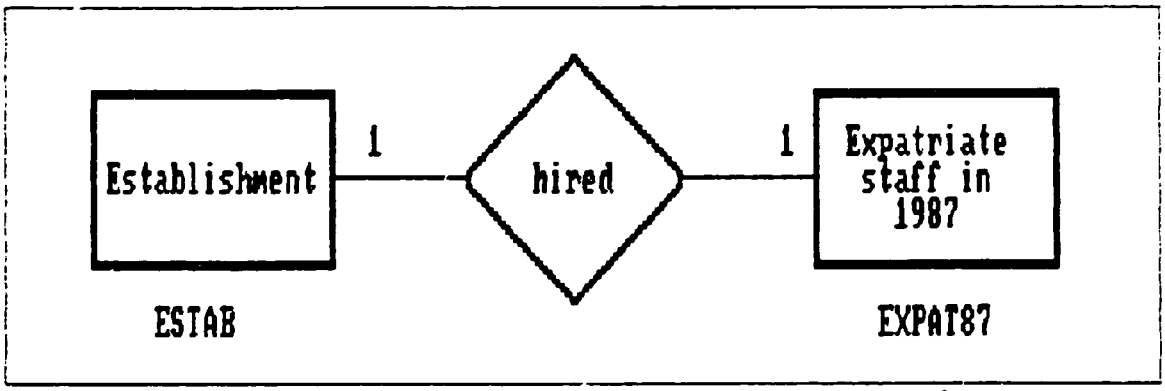


Figure 9Expatriate staff hired by Establishment in '87

ATTRIBUTES FOR EXPAT87. The table contains the profile of expatriate workers in Establishment SERIAL_NO. A separate file is used because very few establishments hire expatriate labour.

Field	Field Name	Type	Width	Description
1	SERIAL_NO	N	8	Same SERIAL_NO as in ESTAB file
2	WK_PRO_MAL	N	3	No. of male working proprietors
3	WK_PRO_FEM	N	3	No. of female working proprietors
4	APP_MAL	N	3	No. of male apprentices
5	APP_FEM	N	3	No. of female apprentices
6	MNG_MAL	N	3	No. of male managers/technical workers
7	MNG_FEM	N	3	No. of female managers/technical workers
8	CLK_MAL	N	3	No. of male clerical and office staff
9	CLK_FEM	N	3	No. of female clerical and office staff
10	OPE_MAL	N	3	No. of male operatives
11	OPE_FEM	N	3	No. of female operatives
12	OTH_MAL	N	3	No. of male others
13	OTH_FEM	N	3	No. of female others
	** Total **		45	

9. Production of Establishment in '87.

Each establishment generally produces several products, and each product may be produced by different establishment. Consequently, the Establishment-Product relationship is many-to-many, as shown in Fig. 10. The relationship may be modelled by using an associative object, which may be called "production", which will translate into a correlation table, as shown in Fig. 10. The resulting objects are ESTAB, PRODUCTS, and PRODTN87, described below.

ATTRIBUTES FOR PRODUCTS. The table contains the details of products produced by Establishment SERIAL_NO.

Field	Field Name	Type	Width	Description
1	PRDCT_CODE	C	6	ISIC 6-figure Product code, or code from the Nigerian Customs and Excise Harmonised Tariff. Linked with ESTAB through the correlation table PRODTN87.
2	PRD_DESCR	C	20	Product description
	** Total **		27	

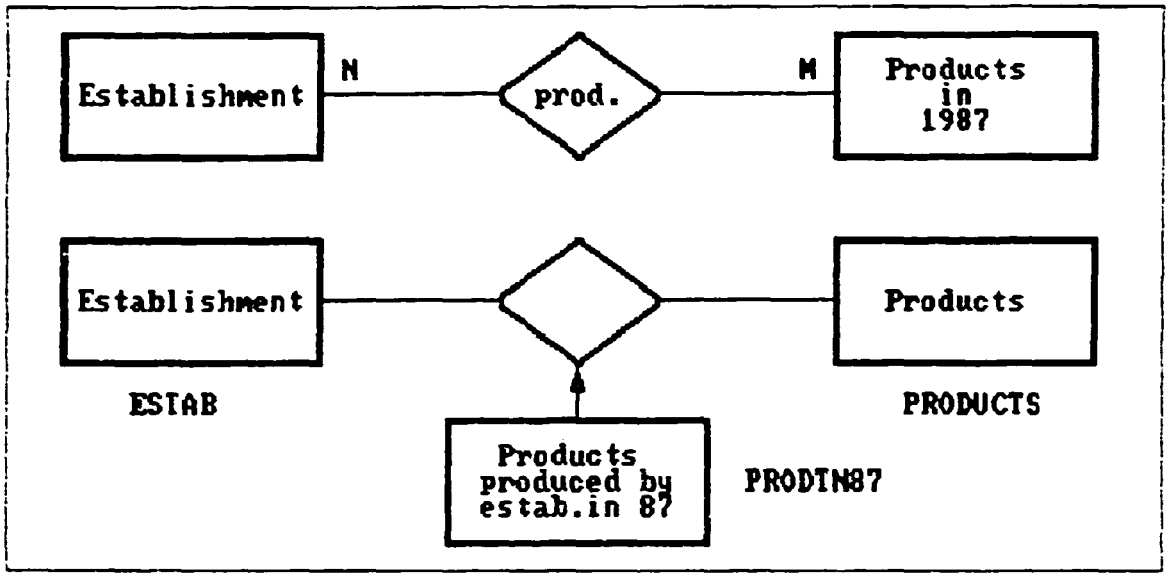


Figure 10ERD modelling the products of Establishment in 1987. The many:many relationship is implemented with a new table: PRODTN87 which contains the products produced by Establishment in '87.

ATTRIBUTES FOR PRODTN87 correlation table. It contains the details of products produced by Establishment SERIAL_NO. This table links ESTAB and PRODUCTS to give details of the production figures in '87.

Field	Field Name	Type	Width	Description
1	SERIAL_NO	N	8	Same SERIAL_NO as in ESTAB file. Referencial attribute linking with ESTAB.
2	PRDCT_CODE	C	6	ISIC 6-digit code for industrial products or Product code from the Nigerian Customs and Excise Harmonised Tariff. Referencial attribute linking with PRODUCTS.
3	UNIT	C	2	Unit of measurement
4	INST_CAPCY	N	8	Installed capacity
5	QTY	N	8	Quantity
6	VALUE	N	9	Value
7	QTY_EXPORT	N	8	Quantity exported.
** Total **			50	

10. Materials used by Establishment in '87.

Each establishment generally uses several raw materials and each material may be used by different establishme t. Consequently, the Establishment-Material relationship is many-to-many, as shown in Fig. 11, similar to Fig. 10. The relationship may be modelled by using an associative object, which may be called "materials-used", which will translate into a correlation table, as shown in Fig.

11. The resulting objects are ESTAB, PRODUCTS, and MATUSE87, described below.

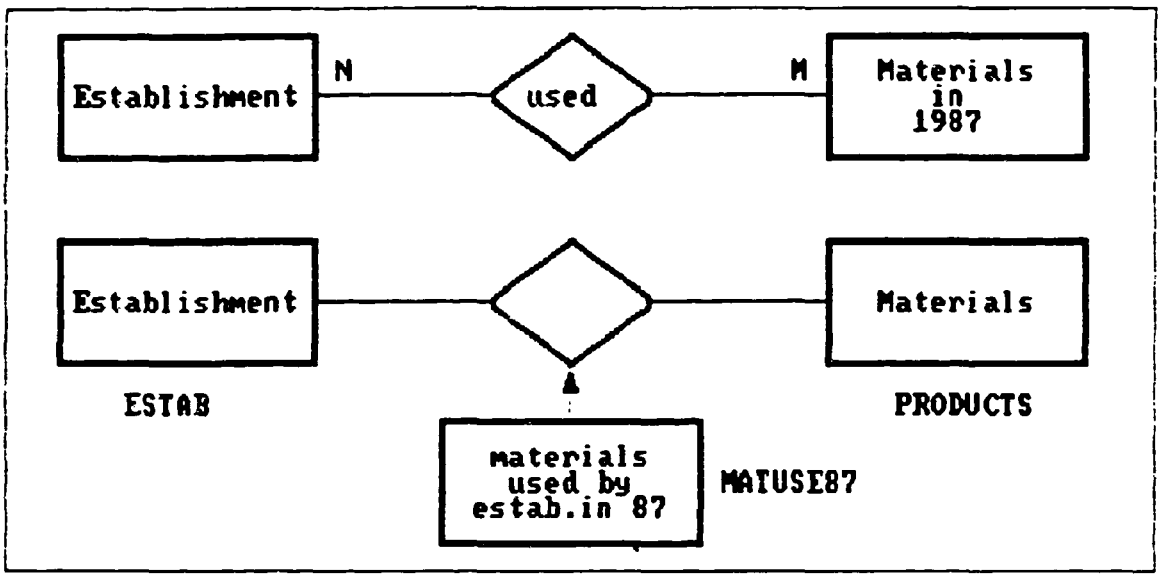


Figure 11ERD representing the many-to-many relationship between Establishment and products. The table MATUSE87 contains the materials used by Establishment in 1987.

ATTRIBUTES FOR MATUSE87. The record contains the details of materials used by Establishment SERIAL_NO. This correlation table links ESTAB and PRODUCTS.

Field	Field Name	Type	Width	Description
1	SERIAL_NO	N	8	Same SERIAL_NO as in ESTAB file.
2	MATER_CODE	C	6	ISIC 6-digit code or code from the Nigerian Customs and Excise Harmonised Tariff.
3	UNIT	C	2	Unit of measurement of material.
4	TOT_QTY	N	8	Quantity
5	TOT_VALUE	N	9	Value
6	QTY_IMPORT	N	8	Quantity imported
7	VALUE_IMPO	N	9	Value of material imported
** Total **			51	

11. Nationality of main foreign partner in '87.

Few establishments have a (main) foreign partner. Thus, the relationship between the Establishment and Foreign nation objects is 1-to-1, but conditional. This relationship may be modelled using a correlation table (NATION87) to link the Establishment table ESTAB and the table of Nations (Fig 12).

ATTRIBUTES FOR NATION87. The record contains the code of the country which is the main foreign partner of Establishment SERIAL_NO. The name of the country is in file COUNTRIS. This table is used since very few establishments have a foreign partner. This table is linked to COUNTRIS.

Field	Field Name	Type	Width	Description
1	SERIAL NO	N	8	Same SERIAL_NO as in ESTAB file.
2	NATION	C	6	Nation code (FOS).
** Total **			15	

ATTRIBUTES FOR COUNTRIS. The record contains the code and name of all countries in the world.

Field	Field Name	Type	Width	Description
1	NATION	C	6	Nation code as in file NATION.
2	NATIONNAME	C	30	Nation name
** Total **			37	

12. Receipts for Non Industrial Services.

In the 1987 Census questionnaire, Establishments were asked to state the income from Non Industrial Services (NIS) rendered by the Estabhisment. The Industrial Services were listed at the end of the questionnaire. Since each establishment pays for one or more NIS, and each NIS will apply to several establishments, the relationship is many-to-many. It may be modelled by a correlation table, which may be called "Receipts-for-NIS-in-'87" or RECNIS87. This table will link the Establishment table ESTAB and the table of receipts for NIS, NISRES, (See Fig. 13).

ATTRIBUTES FOR RECNIS87. The record contains the code of the Non Industrial Service paid to Establishment SERIAL_NO.

Field	Field Name	Type	Width	Description
1	SERIAL NO	N	8	Same SERIAL_NO as in ESTAB file.
2	NIS CODE	C	4	Code for the Non Industrial Service (listed at the end of ESTAB form)
3	COST	N	9	Amount.
** Total **			22	

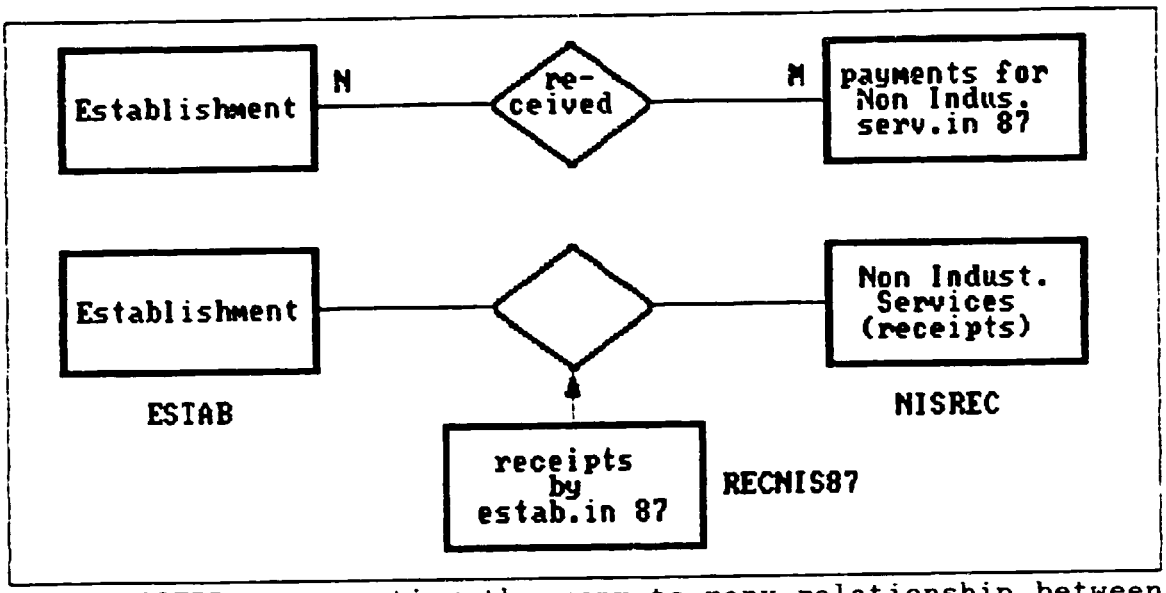


Figure 12ERD representing the many-to-many relationship between the Establishment and the receipts for Non-Industrial Services.

ATTRIBUTES FOR NISREC. The record contains the description of the Non Industrial Service (Receipts) NIS_CODE. This table is linked to RECNIS.

Field	Field Name	Type	Width	Description
1	NIS CODE	C	4	Code for the Non Industrial Service (listed at the end of ESTAB form)
2	NIS_DESCRPT	N	60	Description
** Total **			65	

13. Payments for Non Industrial Services in '87.

The same argument for the receipts of NIS in Section 12 applies to payments for NIS. Figure 14 shows the ERD. The correlation table PAYNIS87 relates the Establishment table ESTAB and the table of Payments for NISPAY.

ATTRIBUTES FOR PAYNIS87. The record contains the code of the Non Industrial Service paid by Establishment SERIAL_NO.

Field	Field Name	Type	Width	Description
1	SERIAL NO	N	8	Same SERIAL_NO as in ESTAB file.
2	NIS CODE	C	4	Code for the Non Industrial Service (listed at the end of ESTAB form)
3	COST	N	9	Amount.
** Total **			22	

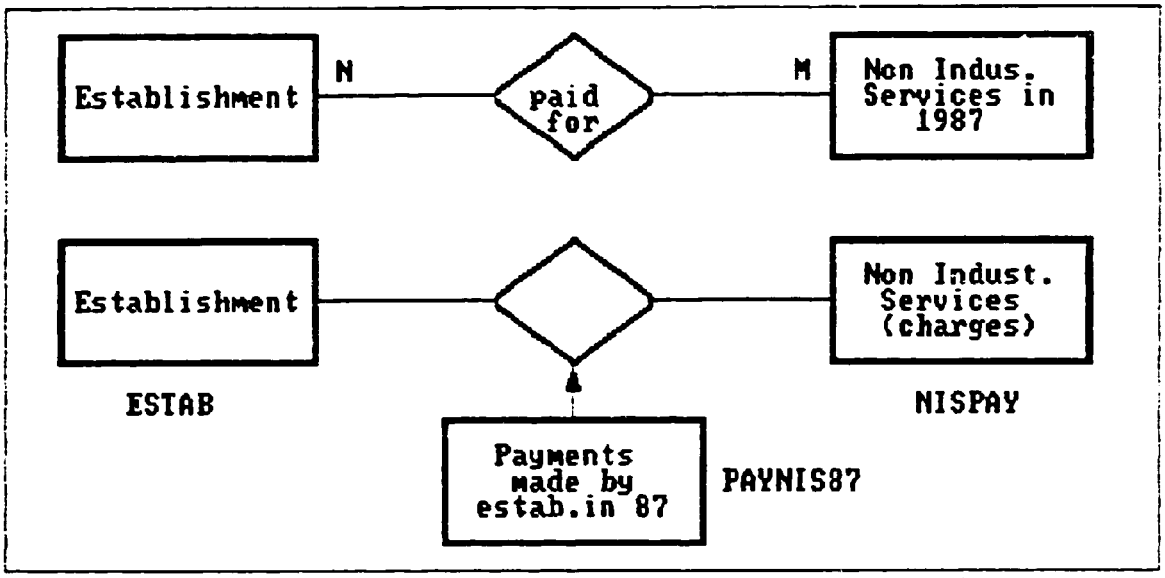


Figure 13ERD modelling the many-to-many relationship between the Establishment and the Non-Industrial Services payments for the year '87.

ATTRIBUTES FOR NISPAY. The object contains the description of the Non Industrial Service (Payments) NISP_CODE.

Field	Field Name	Type	Width	Description
1	NISP_CODE	C	4	Code for the Non Industrial Service (listed at the end of ESTAB form)
2	NISP_DESCRP	N	60	Description
** Total **			65	

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16 December 1991

APPENDIX 5

PROPOSAL FOR CONDUCTING REGULAR INDUSTRIAL SURVEYS

1. Historical Background

The Ministry conducted its first survey in 1981. One of its results was the publication of an Industrial Directory. UNIDO Experts collaborated in the design of the questionnaire used for the Survey.

The proposal for a second Survey started in 1983 but it did not materialise. Its main aim was to provide updated information for the Ministry's Data Bank, one of the first Sectoral Data Banks approved by the Federal Government.

Another attempt to conduct an Industrial Survey was initiated in 1986, with an external Consultant to co-operate with the Ministry staff. The assistance of FOS was also sought, but it did not materialised.

For the 1986 Survey, the Ministry planned to use its own resources at Abuja, as well as the co-operation of its IDC staff and the ministries of Commerce and Industry in the states. The Ministry approved a budget of one million Naira for the exercise, as well as the purchase of five vehicles.

At this stage, the World Bank intervened through the Minister of National Planning, insisting that the proposed Survey should be merged with the National Census of Industries and Businesses (NCIB) that the FOS was planning.

As a result, the then Minister of Industries approved the collaboration with FOS in April 1988. The Ministry made available to FOS four hundred and thirty five thousand Naira (₦ 435,000) and four vehicles. The Ministry also paid the allowances of its staff at headquarters and in the states that took part in the census. At the end the total bill amounted to about 1 million Naira (₦1 m).

The results obtained from the collaborative exercise with the FOS have not been satisfactory:

* The NCIB 87 Survey has not yet been completed more than four years later.

* The listing exercise was inadequate.

* The coverage differed form state to state. While most states obtained information from establishments of five employees and above, some states restricted themselves to establishments with ten or more employees.

* The response level was low.

* The FOS restricted the Ministry from access to the complete primary data generated in the exercise, which is the main source of information for the Ministry's Data Bank.

As a result, the R&S Division of the Ministry proposed in 1990 to conduct an independent survey for the year 1989. The proposal suggested the involvement of the IDCs, IID, NISER-ICD and PAD, as well as the ministries of Commerce and Industries in the states. The estimated cost was eight hundred and forty thousand Naira (₦840,000). Although the proposal was accepted by the Director of PR&S and the Director General, it was not sanctioned by the Honourable Minister.

A new proposal for a survey was made for the current year 1992 with a budget of about 1 million Naira. The Ministry approved only half of that amount, but this implies an implicit approval of the survey.

The following sections examines the pros and cons of the Ministry conducting regular Industrial Surveys, and ends by proposing recommendations to solve the vital issue of data availability to the Ministry.

2. Advantages of conducting surveys.

2.1. Currency of information.

If surveys are conducted by the Ministry, the currency of the data will significantly improve, since due to the problems facing FOS, in terms of scarcity of financial and operational resources, as well as from their over-crowded schedule, there is usually a significant delay in data production. The implication of this delay is that the information that the Ministry and other Data Bank users may obtain from these questionnaires would only have a *historical* value, and not the up-to-date information required for investment, policy analysis and monitoring, etc.

2.2. Completeness of information.

Presently, the FOS is only willing to allow the IDB to photocopy (at the Ministry's expense) part of the retrieved survey questionnaire, not allowing the Ministry to photocopy parts related to the identification of the establishment. The immediate implication of this is that the IDB will not be able to cross-validate returns from establishments for different years. It will not be possible either to produce a vital output: the Industrial Directory for each year.

2.3. Acquaintance of Ministry staff with the real problems facing the Industrial Sector.

If the IDC and IID officers deployed to the States are involved in the data collection exercise, they will gain an invaluable insight into the actual problems facing the establishments which they are meant to assist. This will undoubtedly improve their efficiency.

2.4. The level of response will likely improve.

The IDB plans to conduct the survey by personal contact with each establishment. Cooperation will be sought from the respondents by emphasizing the need to fill in the questionnaires promptly and accurately. This is expected to help management realise the importance of providing an accurate picture of the state of their manufacturing establishment to the Government for it to formulate effective policies for the benefit of the Industrial Sector in particular and the Country in general.

IID and IDC staff deployed to the states enjoy a good relationship with the manufacturing establishments with which they are in close contact. Besides persuading the respondent to fill in and return the questionnaires, they could also help in filling the questionnaires accurately. Ministry staff visiting the establishments will convince them of the confidentiality with which the information given will be treated. This is expected to significantly improve the currently low response level.

2.5. Scarce financial resources would be better utilised.

The FOS is charging the Ministry for the industrial surveys they conduct, although the Ministry has little control over the resources and is not able to make effective use of the data available due to the restrictions presently imposed by the FOS. But if the resources are under the control of the Ministry, a tighter supervision can be exercised over the funds.

2.6. The information can be useful to all the interested departments of the Ministry.

Having full control over the design of the surveys means that the questionnaire could be designed to accommodate the information needs of the different departments of the Ministry, thus enhancing the effectiveness of the exercise. (Presently, the FOS controls the design of questionnaires, although with an input from the FMIT.)

2.7. There is legal backing for Government Agencies to conduct their own Surveys.

FMIT has now two legal instruments to carry out its own surveys which empowers the Ministry to collect any information from manufacturing establishments:

* Industrial Inspectorate Decree Number 53 (1970), and

* The Nigerian Enterprises Promotion Decree Number 54 (1989), of a wider scope.

2.8. Trained statistical and data processing staff already available at the Ministry.

While the staff FOS employs for the industrial surveys is not specialised, the Ministry has qualified and trained staff, which is well acquainted with the industrial environment, to successfully conduct surveys and censuses. Besides, the last industrial census conducted by FOS (1987) only involved 50% of FOS staff, the remaining personnel being from the State Statistical Agencies and FMIT.

For the data processing stage, the computer facilities currently as well as the trained staff available at the Data Bank makes it possible to process an annual survey of medium and large industrial establishments (with 10 employees and above) in less than a month.

3. Disadvantages.

3.1. Duplication of effort.

An undesirable consequence of having more than one agency collecting data is that the scarce resources made available by the government are used more than once for practically the same purpose.

3.2. The Ministry staff may need strengthening, especially at strategic management level.

Even though the Ministry currently has enough operational and intermediate staff deployed in the States to carry out the data collection exercise, it may require experienced statistician(s) to plan and control the exercise at startegic level. The expected arrival of staff from the Technology Section of the former Ministry of Science and Technology may alliviate this problem. Alternatively, the available staff may be sent for training.

4. Recommendations.

After a careful examination of the advantages and disadvantages, it is recommended that the Ministry conducts its own surveys of the Manufacturing Sector.
The disadvantages stated above may be solved.

4.1 The Ministry may take over from FOS the responsibility of conducting regular Industrial Surveys.

The FOS is heavily over-loaded with surveys, not only of all the sectors of the Nigerian economy, but also of other sectors, such as Health, Agriculture, etc. This heavy schedule of duties makes them unable to cope with their work-load. A way of avoiding the duplication of effort mentioned in 3.1 could be solved by asking FOS to hand over the responsibility of conducting Industrial Surveys. They could effectively cooperate with FMIT and have access to all the data at any time. This would enable them to realocate their scarce resources of staff and instruments to their other duties.

4.2 Details of the proposal.

The main stages of the survey are:

1. Design of survey;
2. Design and printing of questionnaires;
3. Lodgement and retrieval of questionnaries;
4. Processing of the data.

The Ministry has embarked on conducting surveys in the past, and experienced staff is available to carry out phases 1 and 2 (the printing may be done outside). The present shortage of statistical staff at strategic managment level may be solved by either redeploying staff from other Ministries, e.g., the FOS, or by sending the available staff for training.

For phase 3, the staff of IDC and IID in the states can be employed. As mentioned above, they are trained and specialised staff that can carry out this responsibility more effectively than the FOS staff. Assistance may be sought from the State Statistical Agencies and the State ministries of Industries and Commerce, since both bodies will be interested in the data.

The processing of the data (phase 4) may be done efficiently and quickly at the Industrial Data Bank. With the present staff and equipment, a whole annual survey of medium and large establishments can be done in less than a month.

A cost estimate for the annual survey was submitted to the Ministry for the current year 1992 by the Statistics Section.

APPENDIX 6

Improving the Quality of the Industrial Data Bank information

1. Introduction.

The main purpose of the IDB is to provide reliable and comparable statistical information to enable its users attain a true picture of the state of the Industrial Sector in Nigeria. The users include not only decision makers at government and private sector levels in Nigeria, but also the international community at large.

The importance of being able to disseminate accurate information can not be overemphasised. Investment from local and foreign sources, and international support for the industrial development of a country is often linked to reliable information on the actual state of the Manufacturing sector of the country.

Several international bodies keep information on Nigeria, including the United Nations Statistics Organisation (UNSO) and The UNIDO Data Base (UDB), a section of the Statistics and Survey Unit (SSU), part of the Division of Industrial Studies of UNIDO. But ultimately, these bodies rely mostly on the information generated by data producers in Nigeria, although data from other data producers may also be used.

The information on Nigeria held by international data bases is rather scanty, however, even when compared with other developing countries. The problem has many facets, but it may not be unrelated with the inability of the Federal Office of Statistics to produce outputs with the required timeliness, quality and coverage.

2. Sources of information for the IDB.

The data currently available at the IDB, at different processing stages include the 1984 and 1985 industrial surveys, and the 1987 census. Besides, data on Public Limited Companies (PLCs) produced by the Stock Exchange for several years is also available, although not yet processed.

The issue of availability of primary data from the FOS is yet unresolved, since no agreement has been reached between the Ministry and the FOS on the extent of accessibility of the primary data by the IDB. This issue is of paramount importance since the annual surveys are the most comprehensive source of data available at present.

But other data sources, both national and international, may also be used to complement and improve the information available. Data producers in Nigeria that generate industrial data include,

- The Federal Office of Statistics, which besides the annual surveys covering establishment with 10 or more employees, and censuses of establishments of 5 or more employees mentioned above, conducts Quarterly Industrial Surveys of some important branches.

- The Central Bank of Nigeria and the Customs and Excise Department, which may provide accurate information on Imports and Exports of manufactured products.

- The Manufacturers Association of Nigeria (MAN), which periodically produces a register of manufacturing establishments with some basic information about them.

- The Policy Analysis Department, which has a database on parastatals.

- The Stock Exchange, which generates reports on big manufacturing firms (the Public Limited Companies). The reports from the Stock Exchange are particularly valuable since they are up-to-date and do not suffer from the possible distortion which may affect smaller establishments - PLCs are bound to accurately report the state of their firms.

- The National Provident Fund which may provide reliable data on employment.

- The State Statistical Agencies, for data at State levels.

Among the international data producers that can provide useful information at national level to the IDB are,

- The UNIDO Data Base (UDB).

- International Labour Organisation (ILO) which keeps data on employment.

- Independent sources such as Global-Stats Ltd (U.K.) which distribute off-line databases with data on Finance, Trade, World Commodity prices, etc., for a number of countries.

These sources may be combined in order to produce a database as comprehensive, accurate and useful as possible, not only for the internal needs of the Ministry (the IDB's primary user) but also for users inside and outside Nigeria.

It is therefore necessary for the IDB to produce information that conforms to accepted international standards. This could be

achieved by following the guidelines set up by the UNSO. These guidelines set standards on coverage, scope, and definitions of the variables and indices that are useful in portraying a faithful picture of the Nigerian industrial sector.

3. Problems related to the primary data of the IDB.

A constant effort is required to attain an acceptable level of quality in an area as difficult as Industrial Statistics, which is full of constraints and pitfalls. Some of the problems at the level of primary data include,

- Lack of an accurate and up-to-date register of establishments, which will affect the coverage of surveys and censuses.
- Lack of statisticians and enumerators on the ground.
- Inadequate records kept by the establishments.
- Deficient follow-up mechanisms for the retrieval of questionnaires.
- Defective compliance mechanisms.
- Lack of confidence of respondents that the confidentiality will be kept, which leads to filling in wrong information.
- The apparent lack of a data culture which leads to rather poor response levels. (The last census of 1987 covered only around 50% of the establishments.)
- Restrictions imposed by the FOS on the accessibility of primary data to the IDB which may significantly hamper the quality of the results.

These and other constraints combine together to produce distorted data to the IDB, even before the processing of the data starts. For this reason, the primary data obtained from the FOS may be combined with other secondary data sources to help correct the problems. Even though the coverage of the surveys of these institutions is not as complete as the surveys and censuses of the FOS, which at present constitute the main source of primary data to the IDB, they may help to correct and improve the quality of the IDB database.

4. Methods to solve the Problems facing the IDB data.

Being aware of the problems facing the quality of the data is already a step forward. The shortcomings must now be addressed.

Some of the methods that can be used to solve the problems are now discussed.

4.1 Treatment of missing data items in primary data.

The first problem relates to the primary data coming from the FOS.

When the respondent establishment fails to fill in a data item, treating the entry as zero may lead to a distortion in the corresponding value when aggregating. For example, let us assume that a firm does not fill in the number of operatives, while entering other values, such as total sales, etc. The missing value should be estimated lest the aggregated variable be underscored. The estimation of the missing data item is more important when the market share of the establishment is significant. The missing data item may be computed from the ratio of the variable for which data exists as follows.

Let us assume that the values for a variable x for a given industry is available for all the establishments while, the corresponding value for a second data item y for establishment i, y_i, is missing. The missing value y_i, may be estimated by assuming that the ratios for variables x and y are the same, i.e.,

$$\frac{x_i}{\Sigma\, x_j} = \frac{y_i}{\Sigma_{j \neq i}\, y_j + y_i}$$

From this equation the unknown y_i can be computed.

If several values are missing, they can be estimated one at the time, ignoring the other missing items.

4.2 Treatment of missing gaps at the level of branch or combined branches.

Some statistical procedures may be used to obtain satisfactory estimates for a given variable when aggregates from different sources are available. These methods include interpolation, proxy variables and related variables.

Interpolation.

If a given variable is missing for a year but is available for the surrounding years, the missing year can be estimated by interpolation with a curve having an acceptable value for the *goodness of fit* statistics, using as many surrounding years as possible. This approach is justified by the fact that sudden

changes are rare, which imply rather constant values for ratios.

Interpolation should be used judiciously, and a plot of the fit is advisable. This is easily accomplished by using a graphics application developed for the purpose. Ideally, about 7 surrounding values should be used to interpolate the value for the variable of the missing year. Parabolic or cubic interpolation may be used.

Proxy variables.

A variable which measures industrial activity, and which is not available, may be estimated by a proxy variable which is an indicator that measures roughly the same dimension as the unknown variable. For example, Gross Sales is a proxy variable of Gross Output since they only differ in the change of stocks of Work-In-Progress and finished goods. Wages and Salaries is a proxy variable for Employment, which can be estimated when the value of the Wages ratio, i.e., the Wages per employee, is known for a given branch or combined branches.

Related variables and derived indicators.

Two variables are related when they are closely tied, even though they are measured in different dimensions. For example, Labour Remuneration is related to Employment, and Value Added is related to Gross Output. Ratios of related variables are called *derived indicators.* Derived indicators are used to disaggregate values.

In order to apply derived indicators, it is required to have values for

- one of the derived variables for several years at branch level (4-figure ISIC);
- the corresponding values for the derived indicators for the combined branches for the same years (possibly obtained from supplementary sources), and
- the value of the derived indicator for the branch in question for the year required.

Assuming that the ratio of the derived indicator at branch level and at the combined branch level does not change significantly from year to year, it is possible to compute the other related variable for the year in question.

Example of the use of related variables.

Let us assume that we want to estimate the Wages and Salaries

for dairy products (ISIC 3112) for 1985 (w_{das}), knowing

- the employment for dairy products for several years ... e_{da3}, e_{da4}, e_{da5}, e_{da6}, ...
- The values of the derived indicators for the same years for Food products (ISIC 311), which includes dairy products, .. W_{fa3}/E_{fa3}, W_{fa4}/E_{fa4}, W_{fa5}/E_{fa5}, W_{fa6}/E_{fa6}...
- The value for the derived indicator for dairy products for 1985, e.g., w_{da5}/e_{da5}.

Assuming that the ratio of the derived indicators do not change significantly in two adjacent year, i.e.,

$$\frac{w_{da4}/e_{da4}}{W_{fa4}/E_{fa4}} = \frac{w_{da5}/e_{da5}}{W_{fa5}/E_{fa5}}$$

then,

$$w_{da5}/e_{da5} = W_{fa5}/E_{fa5} \frac{w_{da4}/e_{da4}}{W_{fa4}/E_{fa4}}$$

Finally, the Wages and Salaries for dairy products for 1985 may be obtained as

$$w_{da5} = (w_{da5}/e_{da5}) \cdot e_{da5}$$

APPENDIX 7

Final Screening of annual survey data

The following tests may be added to improve the quality of the data from surveys and censuses maintained at the IDB. They are based on tests conducted at the UNIDO Data Base (UDB).

The establishments or ISIC groups that do not pass the tests may be stored in a file containing the establishment number or ISIC group and a set of flags. A flag is set to a value > 0 if the corresponding test fails.

The tests involve the indicators Value Added (VA), Gross Output (GO), Labour Remuneration (LR), and Employment (E), which are defined as follows:

Value Added: Total sales of finished products - Total Raw materials - Total Energy (Fuels + Electricity) + Change in stock of finished products.

Gross Output: Total Sales of finished products + Change in stock of finished products.

Employment: Total number of employees including managerial, professional, administrative, clerical and office workers, and operatives.

Labour Remuneration Total Wages and Salaries + Employers' contributions to National Provident Fund and private pension schemes + other labour benefits.

1. Tests at firm level.

1.1. Remuneration/value added.

A firm that is operating is meant to make a profit. Thus the Labour Remuneration (LR) should be greater than the Value Added (VA). Then Flag 1 is set to 1 if

$$LR/VA > 1$$

1.2. Value Added (VA)/ Gross Output (GO).

Flag 2 is set to 1 if

$$VA / GO > 1$$

Flag 2 is set to 2 if

$$VA / GO < 0.03$$

i.e., when the Value Added is less than 3% of the Gross Output.

1.3 Consistency check.

If the value of any of the following variables (GO, VA, LR or E) is zero, then the other variables should also be zero. Flag 3 is set to 1 if the test fails. (Negative values for LR and E have been prevented by the data entry program.)

Flag 4 is set to 1 if the computed VA is negative.

Flag 5 is set to 1 if the computed GO is negative.

2. At sector level

The tests described above (1.1, 1.2, and 1.3) can be applied to the different industries (ISIC groups) as well as to establishments. Besides, there are other tests that are specific to industries. These tests have to be carried out for several years.

2.1 Labour Remuneration (LR) / Employment (E).

For each of the 28 ISIC industries the following values are obtained,

$$LR_i \qquad E_i \quad \text{and the ratio } LR_i / E_i$$

The mean value of the ratio for all the industries (LR/E) is then obtained. The index WE_i for each industry is calculated by dividing the ratio LR_i/E_i for the industry divided by the mean.

The coefficient of variation CV of WE, defined as the ratio of the standard deviation of WE_i and the mean value, is then calculated.

The tests involve the WE and CV for each industry as follows:

Flag 6 for a given year and industry is set to 1 if

$CV \leq 0.25$ and $WE<0.5$ or $WE> 2.00$ and the change of WE from the previous year $\Delta WE > 0.15$

Flag 6 is set to 2 if

$CV > 0.25$ and $WE< 0.25$ or $WE > 4.00$ and $\Delta WE > 0.3$

Flag 7 is set to 1 if

$CV \leq 0.25$ and $\Delta WE > 0.25$

Flag 7 is set to 2 if

$CV > 0.25$ and $\Delta WE > 0.50$

2.2 Value Added (VA) -/53 Employment (E).

This index is computed excluding the ISIC 353 (Petroleum refineries) and 354 (Miscellaneous petroleum and coal products). The index VE is defined like the WE index for each industry (excluding ISIC 353 and 354).

Flag 8 is set to 1 if

VE < 0.25 or VE > 5.00 and $\Delta VE \geq 0.50$, where ΔVE is the change of VE from one year to the next.

Flag 9 is set to 1 if

$\Delta VE \geq 1.00$

For ISIC 353 and 354,

Flag 10 is set to 1 if VE < 0.50 or VE > 15.00 and

$\Delta VE \geq 1.00$.

Flag 11 is set to 1 if $\Delta VE > 2.00$

2.3 Employment.

These tests refer to adjacent years j and j+1 and are calculated for each industry. The value E is the rate of change in employment, i.e.,

$$\Delta E = (E_{j+1} - E_j) / E_j$$

Flag 12 = 1 if $E_j = 0$ and $E_{j+1} > 1,000$

Flag 12 = 2 if $E_j > 1,000$ and $E_{j+1} = 0$

Flag 13 = 1 if $E_j \leq 1,000$ and $E_{j+1} > 10,000$

Flag 13 = 2 if $E_j > 10,000$ and $E_{j+1} \leq 1,000$

Flag 14 = 1 if $1,000 < E_j \leq 10,000$ and $E_{j+1} > 20,000$

Flag 14 = 2 if $E_j > 20,000$ and $1,000 < E_{j+1} \leq 10,000$

Flag 15 = 1 if ($10,000 < E_j < 100,000$ and $E_{j+1} > 10,000$)

or

($10,000 < E_{j+1} < 100,000$ and $E_j > 10,000$) and $\Delta E > 1.00$

Flag 16 = 1 if (E_j and E_{j+1}) > 100,000 and $\Delta E > 0.25$

2.4 Check for totals of the key economic indicators for all the industries.

Flag GO = 1 if the sum of the GO's for all the industries differs in more than 0.5 percent from the total GO for

the manufacturing sector (TGO), i.e., if

$$TGO \; / \; (\; \Sigma \; GO_i \;) \geq 1.005$$

or

$$TGO \; / \; (\Sigma \; GO_i \;) \leq 0.955$$

Flag VA = 1 if the sum of the VA's for all the industries differs in more than 0.5 percent from the total VA for the manufacturing sector (TVA), i.e., if

$$TVA \; / \; (\; \Sigma \; VA_i \;) \geq 1.005$$

or

$$TVA \; / \; (\; \Sigma \; VA_i \;) \leq 0.955$$

Flag LR = 1 if the sum of the LR's for all the industries differs in more than 0.5 percent from the total LR for the manufacturing sector (TLR), i.e., if

$$TLR \; / \; (\; \Sigma \; LR_i \;) \geq 1.005$$

or

$$TLR \; / \; (\; \Sigma \; LR_i \;) \leq 0.955$$

Flag E = 1 if the sum of the E's for all the industries differs in more than 0.5 percent from the total E for the manufacturing sector (TE), i.e., if

$$TE \; / \; (\; \Sigma \; E_i \;) \geq 1.005$$

or

$$TE \; / \; (\; \Sigma \; E_i \;) \leq 0.955$$

F.J. Vega Catalán
19 November 1991

APPENDIX 8

List of Courses

M1: Introduction to Computers

M2: Practical Introduction to Microcomputers and MS-DOS

M3: Practical Introduction to Word processing with WordPerfect

M4: Introduction to Spreadsheets with Lotus 1-2-3

M5: Structured Systems Analysis

M6: Database Design

M7: Database Management Systems with dBASE IV

Course Title: **Introduction to Computers** (M1)

Objectives:

1. To get familiarised with common computer concepts.
2. To know how the computer works: its parts and the information flow inside the computer.
3. To be able to select a microcomputer for a given purpose: the cost-benefit approach.
4. To know the basic concepts on software. Systems and applications software.
5. Hands-on experience on the use of popular packages.
6. Exchanging information between computers.

Prerequisites:

None

Contents:

1. The computers as machines to store and handle information. Data types: numbers, words and symbols. Information representation inside the computer: bits, bytes, Kilobytes, Megabytes, Gigabytes. Memory capacity of RAM and disks.
2. Computer parts and how the different parts work together. Hardware overview: ALU, Input and Output devices, the memory (RAM and ROM), disk storage, etc.
3. Software. Systems and applications software.
4. The Operating System: simple commands.
5. Applications software: Word processors, Spreadsheets, Database software, Desktop Publishing, Presentation Graphics, Accounting.
6. Languages used to develop applications. Examples of simple programs in BASIC, PASCAL and dBASE. Assemblers, interpreters and compilers.
7. Practical Word processing: writing a short letter with WordPerfect.
8. Practical spreadsheet: prepare a simple budget with Lotus 1-2-3.
9. Practical database management: create a simple personnel database with dBASE IV.
10. Presentation Graphics and Desktop publishing with Harvard Graphics.
11. Modeling and Simulation with computers using DYNAMO.

12. The SAGE Accounting package.

13. Communications. The Local Area Network (LAN). Remote communication with MODEMs.

Course Title:

Practical Introduction to Microcomputers and DOS (M2)

Objectives:

1. To have a basic understanding and practical experience on the use of microcomputers and its peripherals.

2. To use the DOS to a level sufficient for running standard application packages and doing those tasks necessary for smooth operation.

Prerequisites:

None

Contents:

1. A typical word processing session from start to finish (writing a short letter): booting (cold and warm), entering date and time, inserting and changing diskettes, running the word processor program, etc.

2. Introduction to DOS. Information on disks: files and their names. Recognizing the file type by the extension: BAT, COM, EXE, etc. Global names for files (wildcards).

3. External and internal DOS commands. Basic disk management commands: formatting a diskette, copying an entire disk, etc.

4. Disk organization: root directory and subdirectories. Naming, making, removing and accessing subdirectories. Displaying the structure of directories in a disk. Path.

5. Basic file management commands: copying, renaming and deleting files. Displaying and printing ASCII files.

6. Editing files with EDLIN.

7. Batch files: The CONFIG.SYS and AUTOEXEC.BAT files. Using the commands FILES, BUFFERS, FASTOPEN, etc. The PATH command.

8. TSR programs. A friendly DOS interface: the Norton Commander.

Course Title:

Practical Introduction to Word processing with WordPerfect (M3)

Objectives:

To learn how to use the main capabilities of the most popular wordprocessor: WordPerfect.

Prerequisites:

None

Contents:

1. Basic computer skills prior to using the word processor. Some simple DOS commands. Care of computer equipment and disks.

2. WordPerfect basics. Starting and ending WordPerfect. File management in WordPerfect.

3. Selecting commands. Using the menus.

4. Typing a document from start to finish.

5. Moving the cursor and using blocks. Underlining and using bold characters. Changing the font. Viewing the document.

6. Editing text. Using the speller and the thesaurus. Relocating and replacing text. Controlling page breaks. Indenting text. Centering text. Creating text columns.

7. Saving and retrieving documents. Working between documents.

8. Printing a document. Formatting a page. Page number. Creating columns. Setting margins, tabs and other formats.

9. Capturing graphics into a document. The "Grab" utility. Graphics.

10. Using Macros.

Course Title:

Introduction to Spreadsheets with Lotus 1-2-3 (M4)

Objectives:

This course is designed to give participants:

1. A fundamental knowledge of the principles of spreadsheets.
2. An understanding of the terms and key commands used to create, maintain and process spreadsheets.
3. The ability to modify, extend, and reformat an existing spreadsheet.
4. Awareness of the capabilities and limitations of spreadsheets
5. The ability to solve simple computational problems using the spreadsheet.

Prerequisites:

Some knowledge of MS-DOS.

Contents:

1. 1-2-3 Basics. Entering and exiting the 1-2-3 worksheet. Moving around the worksheet. Values, labels and formulas. Entering and correcting cell entries. Accessing menus.
2. Block commands: Erase, Move and Copy. File operations: Saving and retrieving spreadsheets. Printing. Exporting spreadsheets to a other software.
3. Formatting blocks: selecting a display format. Changing column widths. Inserting and deleting rows and columns.
4. Creating graphs. Types of graphs. Entering values, labels and titles. Printing graphs.
5. Database management. Arranging data. Searching for data.
6. Basic spreadsheet functions.
7. Creating a department's annual budget. Trying "What-if" conditions.
8. The Quattro spreadsheet.

Course Title: **Structured Systems Analysis (M5)**

Objectives:

To familiarise the participant with modern tools of systems analysis with mini case studies.

Prerequisites:

None

Contents:

1. Viewing the project as a system. Defining roles in a project: users, management, auditors, systems analysts, systems designers, programmers and operations personnel.

2. Tools of systems analysis: Data Flow Diagrams (DFD), Entity Relationship Diagrams (ERD), Data Dictionaries (DD).

3. Process specifications: Structured English, Pre/Post Conditions, Decision Tables.

4. Data models. The components of an ERD: objects and relationships. Attributes of an object. Types of relationships.

5. The project life. Project management tools. Cost-benefit analysis. CASE software.

Course Title:

Database concepts and design (M6)

Objectives:

To acquaint the participant with modern techniques of data analysis or data processing management by introducing design concepts illustrated with familiar examples.

Prerequisites:

The participant must be familiar with dBASE to be able to follow the examples.

Contents:

1. Databases and Database management systems.
2. Tables. Null values. Normalisation. Redundancy and duplicates.
3. The data model: objects and relationships. Identifiers. Entity Relationship Diagrams.
2. Defining the objects. Attributes.
3. Types of relationships. Representation of 1:1, 1:many and many:many relationships.
4. Implementation of the concepts with dBASE IV.

Course Title:

Database Management Systems with dBASE IV (M7)

Objectives:

1. To understand the basic principles of database design.
2. To become familiar with the user interface of dBASE IV (the Control Centre) to be able to create, edit, search, display, create input forms and reports of databases *without* programming.

Prerequisites:

Some knowledge of MS-DOS.

Contents:

1. Designing the database. the Data Model: Objects and reliationships. Attributes. Types of reliationships. Implementation of the data model.
2. Entering and Exiting dBASE IV. The Control Centre panels. Creating and Deleting files.
3. Creating a dabase file. Types of fields.
4. Organising the database: the Catalog.
5. Adding, displaying gand editing records in a file. The Browse and Edit screens.
6. Organising the data. Simple and complex indexes. Creating a sorted file.
7. Searching for records.
8. Query-By-Example. View and Update queries. Views of several files. Filtering data. Conditions. Query operators. Aggregate operators.
9. Update queries. Appending, replacing and deleting data.
10. Forms. Design and use of forms. Options: editing allowed, messages, default values, etc.
11. Reports. Quick and custom reports. Layout design. Printer control.