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# INDUSTRY DECISION SUPPORT SYSTEM

OUTLINES OF A CONCEPT  
FOR THE BENEFIT OF SMALL AND MEDIUM SCALE INDUSTRY FIRMS  
IN THIRD WORLD COUNTRIES

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**ABBREVIATIONS**

<b>ABC</b>	<b>Activity Based Cost accounting</b>
<b>AMS</b>	<b>Activity Monitoring System</b>
<b>DSS</b>	<b>Decision Support System</b>
<b>IDSS</b>	<b>Industry Decision Support System</b>
<b>ISICS</b>	<b>Industry Sector Information and Control System</b>
<b>OPI</b>	<b>OPERating Indicator</b>
<b>OPT</b>	<b>Optimal Production Technology</b>
<b>LAN</b>	<b>Local Area Network</b>

## INTRODUCTION

Privatization of public enterprises and private entrepreneurship are today two concepts that attract growing interest in many regions in the world, not least in those countries which are undergoing the transfer from a planning economy system to more market oriented economies. We find this new development both in African and in European countries and it is basically an attempt at increasing industry productivity and effectiveness. Successful companies in this development process can be characterized by some basic features: they are cost competitive, they adapt quickly to changing market behaviour and demand and they can mobilize human resources for creativity in business development.

A market driven company differs from a budget driven company in one very essential way: the performance of the market driven company creates an immediate reaction from the market, a reaction that can be easily measured by the revenue flow. The performance of the budget driven company, on the other hand, is measured by the degree of how well budget plans are being met. As a consequence, a public-owned, budget driven factory may produce at its full capacity even if there is no offset potential on the market.

This basic difference between market driven and budget driven companies has one important consequence: as costs and revenues are directly linked to each other through the market process, there is one uniformly measurable parameter, viz. the cash-flow. This provides the opportunity to measure and evaluate productivity and performance of the company's activities as well as utilization of the company's resources. Accounting control is therefore a vital function in the private company, for cost control but also to improve revenues.

There may be different strategies for the various privatization processes, depending on the level of industrial development and economic system. But the basic goal is the same: to improve total enterprise performance. This improved performance should be achieved through more economic utilization of resources, through a quicker response to market needs and through increased creativity in product and concept development.

A market driven company does not necessarily make less planning than a budget driven one. But the nature of planning differs: business planning with expected revenue is the basis from which the production plans are formulated. The planning as such is necessary for accounting control: performance of the company is assessed through the comparison between actual and planned performance.

The partly new principles involved in doing business in a private company compared to state owned enterprises stem from the fact that the company's economy must be under strict surveillance and control. Investments must be profitable and costs must be balanced with revenues, at least on the average.

Managers must not only be aware of these needs, they must also be able to carry out management control. This management control has a number of components: The manager must understand which accounting parameters should be used for productivity monitoring and which should be used to monitor business performance. Certain parameters are for example more useful for the measuring of resource utilization while others provide more general information. And with appropriately structured information that highlights changes and unexpected events, the manager will have an efficient tool for decision support. This again is of vital importance for the private enterprise to enable fast reaction to market trends, to spot internal inefficiency or to find an optimal investment strategy.

Computerized systems for management decision support have been in use for many years and a number of sophisticated computer models have been developed for this purpose. Due to technological constraints, these systems were first available only on large main-frame computers. With the microtechnology development, decision support systems for managers are now available at a fraction of previous costs.

It is, however, a fact that the diffusion of this kind of management tools into developing countries has been hampered for various reasons. Lack of knowledge about the

systems' capability, lack of understanding of management accounting principles, necessary for making use of such formal systems, lack of experience from using such systems in the daily work lead to no or limited demand. The subject of the management decision process and its related problems in developing countries has not been treated to the same degree as in developed countries and there is therefore a lack of knowledge and, through this, difficult to formulate and to articulate the needs of managers to execute management tasks. Yet another reason is the fact that many decision support systems, developed for use in industrialized countries, show a lack of consistency between information needs in developing and developed countries.

In order to become more competitive with their colleagues in the more developed countries it has been considered important to assist managers in small and medium scale companies in developing countries to develop their understanding of decision support principles. In conjunction with this it has also been felt important to develop a computerbased decision support system, based on modern management principles and adapted to conditions prevailing in many developing countries, to support managers in their efforts to cope with the new business conditions in a market economy.

For this purpose, a computer program has been outlined with the ambition to become an efficient management tool for decision support. The name of the program is IDSS, an acronym for an Industry Decision Support System, and intended to become an important tool for industry managers in developing countries. Its cost accounting module will thus help managers to spot inefficiency in their companies and to take action. Its investment analysis module, designed as a guide for short term investments in production equipment etc, will help managers to evaluate investment alternatives and to make the choice that yields the best return in total factory performance. IDSS uses operating indicators and graphics in the communication with users. The structure and part of the functions of IDSS is a further development of ISICS, Industry Sector Information and Control System, which is further described below.

Experience from earlier attempts to introduce computer based management tools in industry in developing countries shows very clearly, however, that a mere computer program alone is not a guarantee for improved decision-making. The computer program should therefore be part of a total offering, consisting of software, a detailed installation

guideline and, what is very important, a management training course where managers (and other decision makers) will learn about IDSS, its features and functions and, in particular, how these functions can help improve the work of managers.



## PART I: STATUS OF DECISION SUPPORT SYSTEMS

This chapter has the following content:

- Introduction
- Activity Monitoring Principles
- Functional Requirements of Decision Support Systems
- State of the Art in Management Decision Support
- A Third World Perspective on Decision Support Systems
- Industry Sector Information and Control System (ISICS)

### Introduction

Even if there do exist definitions of what should constitute a Decision Support System (see for example the classical definition below), we should feel rather unfettered in this study to the dogmatic interpretation and it would be tempting to try a more pragmatic approach: what are the information needs for an industry company manager in a small or medium scale company in a third world country, faced with contingencies and constraints, partly unknown to colleagues in the more developed countries?

Issues considered by managers in these companies are often complex, ill-structured and interdependent, and in combination with low awareness of management accounting principles, there are often blurred opinions about what are the information needs, in particular as it is often unclear for what purpose the information is to be used. It is therefore probably more adequate to start in the other end and ask the question: what are the needs for making better management decisions?

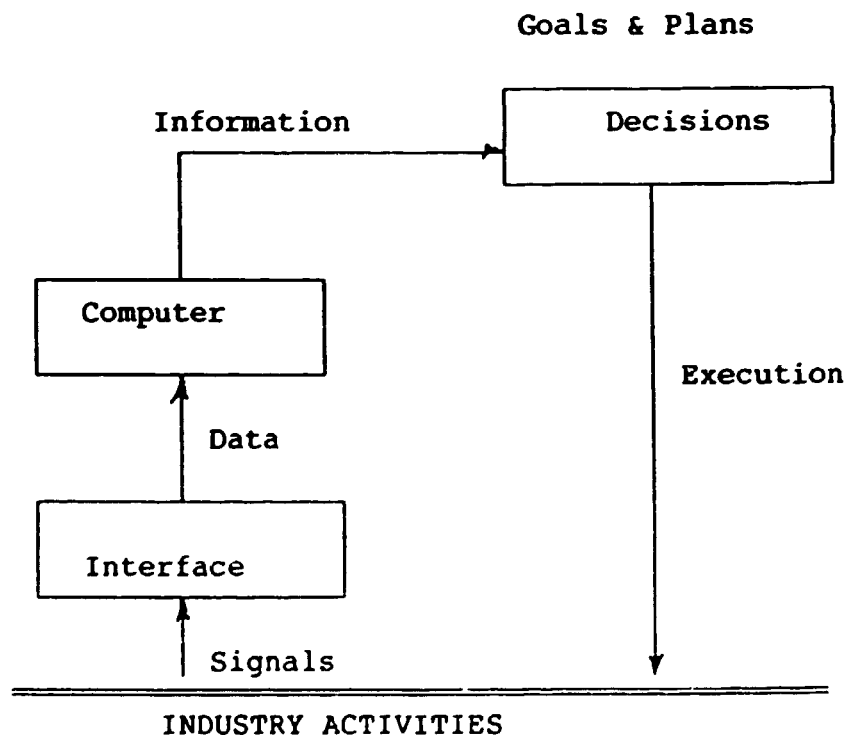
This leads us back to the concept of Decision Support Systems and its already well established framework. After a short discussion about the principles for activity monitoring, one of the corner stones of decision support, we will give an overview of the present DSS-status.

### I.1. Activity Monitoring Principles

Activity Monitoring is a well established concept in management control and refers to how data is collected from a flow of events or activities, how this data is structured in a suitable form and how a decision maker utilizes this structured data for decisions. The flow of events or activities may be a production process, activities within a project or any kind of structured activities which can be measured and compared to a plan. The decision maker may be a production manager, a project leader or any person who has been given responsibility for the effective fulfilment of the planned activities.

The decision maker must, based on the goals for the activities, decide which kind of events are to be monitored, and how the captured data is to be treated to make relevant information for the decision maker. This elaboration of data may be time consuming and is often exposed to the risk for misjudgment or misunderstandings. And when finally data is available in the form of a report, it is not always trivial to judge whether there is an out-of-line situation or not. Computers have here proved to be very useful and to facilitate the monitoring.

A system for Activity Monitoring is therefore practically always based on computerized data and can be schematically illustrated by the following figure:



Industry activities such as production, logistics, marketing and sales etc. are emitting signals in the form of cost of material/spare parts/equipment, of sales revenues, of emergency maintenance etc. These signals are detected by management, provided there are suitable interfaces such as reporting procedures. The signals are then available as (raw-) data and can be processed, using a computer, to information. The information is used by management as decision support. It should be noted that both the signal interfaces ("reports") and the computer programs must be defined in accordance with the company's goals and plans.

### Activity Monitoring Systems

A general Activity Monitoring System can be characterized by the following four basic features:

- the reporting procedures to detect and take care of relevant signals
- the data base for efficient data storage and retrieval
- the computer model to structure the data into useful information
- the pedagogic presentation of decision information

The four features will now be discussed in some detail.

### Reporting Procedures

Not all signals being emitted from the industry activities can be taken care of, some are not even detectable! For example, low product quality may not be detected until customers complain. Or frustration among employees due to inadequate working conditions. These are all signals which may clearly indicate some sort of acute problems, but which are in practice impossible to register in a formal monitoring system. We are often restricted to use quantifiable signals, i.e. signals which are or can be easily transformed to numbers. Such signals are, for example, the number of ad hoc repair hours compared to planned maintenance.

This is of course a serious limitation in the computerized monitoring system: the technology sets the limits as to what kind of signals can be detected and captured. It should, however, be pointed out in this context that

- a computerized Activity Monitoring System (AMS) is a decision support system, i.e. it must be assumed that in addition to AMS there are human beings (for example managers) to detect and take care of those qualitative signals which may be of significance for the company.

- the weakness above is probably compensated by the ability of the computer to structure, compare and present data in an easily comprehensible way (e.g. graphics).

It is important that the captured signals are in proper accordance with the over-all goals and objectives of the project. And reversed, it is not practical to set goals and make plans if it is a priori known that the signals required for evaluating the executed plans can not be detected or captured.

It is also of significant importance that proper routines and methods be used to detect and capture signals in order to provide timely and accurate data for the computer. This step is the most crucial in the whole monitoring cycle as the accuracy of input data will determine the information value for the decision maker.

### Data Base

The data base has two main functions: to store planning and actual (reported) data for each project for a number of periods and to organize and structure data in such a way that it is readily accessible from the computer programs.

### The Computer Model

The kind of information available for the decision maker is entirely depending on how the computer software has been designed to elaborate the input data. The most common way is to compare actual results with planned data, for example actual cost for material with planned (or budgeted) material costs. By comparing these two parameters the decision maker can observe if costs are out of line or not.

It is somewhat more sophisticated to let the computer calculate and store the ratio between actual and planned costs for consecutive reporting periods and present trends for different products. This will allow the decision maker to direct attention to those products which will be most out of line.

The disadvantage with this model is that it does not distinguish between important and less important products. The decision maker therefore has to compare the relative costs of the products with relative product values. This comparison is, however, a suitable task for the computer and the monitoring system will become even more sophisticated by the introduction of operating indicators.

An Operating Indicator (OPI) is a digit, calculated from a simple arithmetic expression of parameters. Total Factory Performance, for example, is such an operating indicator, calculated from total sales revenue and total production cost. With a suitably defined formula, the Total Factory Performance digit should be equal to or greater than one for a company to be successful. A great number of variations is possible here, for example early-warning systems with automatic comparison with performance standards, classification of problem areas, continuous product monitoring etc.

Operating Indicators can of course be defined for a variety of activities, grouped in three main categories:

- OPIs for productivity monitoring
- OPIs for the monitoring of resource utilization
- OPIs for performance monitoring

Indicators for the monitoring and control of industrial processes have been used for a long time. Today their usage has been widely spread also to non-industry applications such as financial monitoring and control and to project management.

#### Presentation of Information

The ability of today's microcomputers (PCs) to use graphic presentation in the form of diagrams, curves, bars etc and even pictures gives the decision maker a very condensed piece of information. Indicating budget value, for example, with a specific colour and actual value with an other colour gives a very clear and easily interpreted diagram for budget status at different time periods.

## I.2. Functional Requirements of Decision Support Systems

The primary objective for industry management is to plan operations so that business goals are achieved, provided the goals are realistic and achievable, and to take appropriate actions to follow the plans as they are executed. If the goals are visionary and long term, they will need to be divided into short term sub-goals which can be transformed into very concrete action plans. The range of a decision support system is primarily within the short term horizon.

In the short time perspective, two basic types of decisions can be expected to meet the company manager, viz. decisions about investments and decisions about the daily operations. Both types of decisions require a mixture of knowledge and information. Knowledge is derived from the manager's own professional experience. Information is available from the different sources which the manager has access to such as market surveys, product catalogues and bankers investment rates.

The most important source of information is, however, the company's own operations/activities monitoring system, giving financial status and trends as well as indications of the company's performance in production, sales etc. Based on the information thus available to the manager, he will need to answer a variety of questions regarding the coming operations of the company. The following are typical questions confronting the manager of an industry:

In order to reach the short term goals, certain investments will have to be made, for instance to increase production capacity through the acquisition of new equipment or to improve product quality through replacement of worn-out machine tools. The industry manager will thus decide whether this investment can be economically justified with regard to the business potential and the market situation, e.g. will the market accept the higher product price, a consequence of the investment?

A mix of products with different variable production costs leads to different market prices. The manager knows that the total revenue from the products needs to cover the total fixed costs of the company. But what are the minimum market prices for the products to ensure this?

Producing at maximum production capacity is not a good strategy if the market potential can not absorb the production output. When market price is set, a certain production volume is implicitly assumed. But how should the market price vary if a fraction only of maximum production capacity is utilized?

These are all examples of questions which the operations manager needs to answer. A pre-condition is, however, that he is aware of the current status of operations, e.g. costs and revenue, actual and compared to plan but also the trend: insufficient revenue (to cover costs) is less problematic if the trend is positive.

It is important to be aware of performance and productivity as well as the utilization of resources. An efficient monitoring system is therefore a vital component for decision support. In general, the following two functions should be provided in a management decision support system:

- monitoring of a company's activities/performance
- analysis of planned investments

#### Monitoring company performance

means that actual costs and revenues as well as manpower and maintenance are compared to plans and discrepancies are reported. Reports are primarily in the form of operating indicators, i.e. simple ratios or arithmetic expressions which are well suited for graphic presentation.

The operating indicators should be used as early warning signals, i.e. performance indicators which are compared by the computer with reference values. It should be possible to select those operating indicators which are useful and relevant for a particular company. This will ensure that only the most appropriate measures are being used.

Operations data will be kept for three years to make it possible to compare results between years.

### Investment analysis

will be used to evaluate/simulate investment alternatives. The critical variable to be measured is the performance indicator, defined as total revenue divided by total cost. With parameters such as total investment, capital cost per year, interest rate, expected revenue increase etc, the two performance indicators, with and without investment, are compared. Certain parameter values can be calculated to optimize the investment.

### I.3. State of the Art in Management Decision Support

The classical definition of Decision Support Systems (Sprague and Carlson, 1982) provides a framework for DSS that consists of a model base, a data base and an interface. During the 1980s, this framework tended in two directions, Management Decision Support Systems and Distributed Decision Support Systems, the difference being that a communications base was added to the latter. With the advent of inexpensive PC-communication networks, this distinction has become less significant.

For Decision Support Systems in industry, the interface and the data base are important as the variety of data being emitted from the industry activities is substantial (see figure below). The model base is build around cost accounting principles which today are seeking new forms, exemplified by OPT (Optimized Production Technology) and ABC (Activity Based Cost-accounting). Concept such as Contribution and Operating Indicators belong to the new features being explored in these new models.

Contribution is a key concept in today's cost accounting systems. Definition may vary from company to company but the basic principle is the same: costs designated as variable are summed along the manufacturing path to arrive at a direct cost. This cost is then subtracted from the selling price to generate a contribution to cover the overhead or fixed costs.

As a decision support tool, the Contribution concept can be used as follows: when generating short term production schedules under capacity constraints, a decision must be made what products to manufacture and which to postpone or drop. It may then be a plausible decision to drop or postpone those products with the lowest contribution and to focus on those which best contribute to the company's profit.



ABC and OPT accounting principles differ significantly from those traditionally provided by accountants in industry. While these have focused on results and balance sheets, driven by the needs to produce annual statutory account reports, ABC and OPT have gained wider use as decision support tools.

Johnson and Kaplan, who introduced Activity Based Cost accounting (ABC), have highlighted the fact that costing systems are used for three main purposes - external reporting, operational control and product costing. Of these, the element which has traditionally driven the accounting systems design has been the need to report for external purposes. As a result, the information available for decision-making is often both inadequate and distorted. Such distorted information is the result of accounting principles established decades ago, when most companies manufactured a narrow range of products. Labour and materials were the most important production factors and overhead costs were fractions only of total production costs.

Today, with increasing market competition and manufacturing automation, direct labour now represent only a small fraction of company costs while expenses covering factory support operations, marketing, distribution engineering and other overhead functions have exploded. A major new contribution now derived from the ABC-philosophy is the development of procedures for detailed analysis of overhead costs to identify the real cost-drivers. This implies the sharing of overheads in costs related to transactions or activities and costs related to volume. In a final analysis step, both these overheads are allocated to products.

Also the Optimized Production Technology (OPT) philosophy is in conflict with traditional viewpoints. OPT thus rejects contribution in its traditional form as a reliable guide for measuring profitability. To optimize the contribution from a production system it is necessary, so OPT, to bring in the bottleneck concept: only through examining capacity limits in bottleneck resources as well as the rate at which different products generate contribution through their consuming of capacity in the bottleneck is it, according to the OPT philosophy, possible to generate a production programme which optimizes total factory performance and profitability. OPT thus uses terms as "return per factory hour", "cost per factory hour" and, derived from these two, "throughput accounting ratio".

Neither the OPT philosophy nor the ABC philosophy are universal accounting recipes that guarantee higher profits. They are potentially important as decision support tools in a range of situations, given that certain critical factors are present. OPT has its strongest use under conditions of capacity constraints where bottlenecks can be explicitly identified and where products and production are relatively homogeneous. OPT works within a short time horizon.

ABC is less restricted to short time frames and is not concentrating on capacity constraints. ABC is not either restricted to homogeneity in products and production. As ABC is concentrating on "cost drivers" its successful application as a management decision support tool is depending on the ability of managers to interpret the ABC results and to take appropriate action. OPT is, in comparison to this, more of a guidance tool for the manager.

Both ABC and OPT have been formalized in computer programs and are widely in use. In addition to these two examples of recent development in decision support philosophy, there are also other concepts based on more traditional principles.

#### I.4. A third World Perspective on Decision Support Systems

Small and medium scale industries in developing countries, facing the needs to invest in new technology and preparing themselves to increased market competition as the transition into market economies continue are in great need of efficient management decision support systems, both to be more cost effective and to reduce the risk of too costly investments.

In practise, nothing would restrict these companies from adopting the newest decision support systems such as OPT, ABC etc. In reality, however, there are hampering factors which would significantly reduce the benefit. Some examples will illustrate this:

OPT is focusing on bottlenecks as capacity constraints and it therefore becomes crucial to identify the most important bottlenecks. In a typical industry in many developing countries there are, however, many bottlenecks which tend to vary in importance, depending on external factors which can seldom be predicted or controlled by the company.

Neither OPT nor ABC have modules for data acquisition but rely on the company's general accounting system. But in many developing countries, the collection and structuring of accurate and timely accounting and operations data is probably the biggest bottleneck!

Finally, the nature of decision support provided by both OPT and ABC needs to be critically evaluated according to current strategic priorities. In many small and medium scale industries in developing countries, strategic priorities are more than often subject to very short term conditions such as the availability of electricity and spare parts, adequate transport facilities, availability of convertible currency for materials import etc.

These and similar conditions thus reduce the applicability of the most recent decision support systems but also more conventional systems for production management control etc have been shown to fail as decision support tools. ( A more detailed discussion on this can be found in Lind, 1991). As this further underlines the need for decision support systems, alternative methods for management decision support should be identified.

In the next section follows a presentation of a system for decision support, particularly developed as a management tool for a developing country. The system has not been primarily designed to be used on a company level but focus' on information needs and decision support requirements on more aggregated levels, for example in a ministry. The basic design of the system, the Industry Sector Information and Control System (ISICS), will, however, be used as a starting point for the new development of a management decision support system for small and medium scale industries in developing countries.

Other decision support systems for the support of strategic decisions on aggregate levels have been implemented in, for example, the Egyptian Cabinet (Sherif, 1988). Decision support systems have also been developed for regional planning in India, (Kaul, 1987).

### I.5. Industry Sector Information and Control System (ISICS)

Based on needs assessment from government in some developing countries with a growing industry sector it was evident that more accurate and reliable information was needed for the monitoring of industrial activities and industry performance. An adapted structure of the information flow to the ministries of industry and similar government bodies with planning responsibility of industrial development would make it possible to measure performance of individual companies and to analyze performance and productivity of different industry sectors. With the advent of microcomputers, the development of solutions to meet these needs have been facilitated.

ISICS, Industry Sector Information and Control System, was recently developed to meet such needs, arising on ministry levels. ISICS stores data about companies and their performance on a regular basis and provides different kinds of reports about performance, productivity and resource utilization per company or per group of companies according to chosen search patterns.

A short notice in UNIDO's Microcomputer Monitor in late 1991 raised further interest about ISICS and there were numerous inquiries from African as well as from Latin American countries. Many of the inquiries focused particularly on the need for performance monitoring on the company level and whether ISICS was intended also for inside company usage as a monitoring system.

As, however, the basic unit of ISICS is the company, and information about company performance is aggregated to higher hierarchical levels such as a ministry, the functions of ISICS do not exactly match with all the needs for a decision support system within a company. It has therefore become evident that there are needs to develop, based on the ISICS principles, a new system for performance monitoring and decision support for small and medium scale industries. The characteristics for such a system, tentatively referred to as Industry Decision Support System, IDSS, are thus outlined in this project proposal.

In August 1992, the first ISICS was installed, within the frames of a UNIDO project, at the Ministry of Industry in a Middle East country and valuable experience has been gathered for the benefit of the IDSS development. It has thus become obvious that there is not primarily lack of data that is most crucial but rather of accurate and relevant information.

ISICS has been developed to support decision makers in their efforts to improve financial control of industrial activities. A necessary condition for such control, based on planning and feed-back of industry activities, is that industry performance can be measured, that managers involved are sufficiently familiar with management accounting principles and that there is a technical infrastructure to capture the flow of information. The Industry Sector Information and Control System is a set of tools to address these issues.

ISICS is designed to be used on an aggregate planning level. Ministries of industry require relevant information from their subordinate companies and factories in order to carry out their major task: to make investments in industry infrastructure and to evaluate efficiency of already made investments. The information flow is in reality bi-directional: from the head organization in the form of plans and directives, to the head organization in the form of feed-back of actual industry performance. This information circuit is crucial for any form of budget control. In numerous organization in developing, but also in developed countries this budget control is, in reality, inadequate or non-existing. The effect is, at the best, that productivity of financial investments is uncertain or unknown. In the worst situations, being too frequent, lack of reliable planning data make investments even counter-effective.

ISICS data base provides information records for each industry/organization unit. Each record has data about organizational belonging, sector/branch/product codes, type of organization, serial number, geographic code, employment size, production achievement, project status (for industry projects under implementation). Industry branches and products are classified in accordance with the international classification system to enable international comparison.

ISICS stresses simplicity in using. Users will find simple ratios ("operating indicators") as indicators of industry performance and trends. This is different from most other computer based solutions which are mostly too complicated for unexperienced users. The ISICS package furthermore includes a detailed User's Manual with Installation Guidelines, Operation Instructions and Functions Description.

The basic idea of ISICS is to avoid sophistication and complexity and to offer a tool that can be implemented and understood by middle managers in their day-to-day professional work.

The primary users of ISICS are ministry staff working with industrial production planning, industrial strategic planning, personnel planning, budgeting and financial control, statistical analysis. But also universities and management training institutes where students are trained in industrial management through the simulation of different scenarios.

(ISICS User's Manual is included as Appendix A)

## PART II: DESCRIPTION OF IDSS

This chapter has the following content:

- Introduction
- Development of ISICS into IDSS
- IDSS Operational Features
- IDSS User Interfaces
- IDSS Users and User Benefits

### Introduction

The Industry Decision Support System (IDSS) is a new concept, designed to meet the needs among company managers of small and medium scale industry firms in third world countries. The IDSS structure follows the model illustrated in the previous chapter where activity signals are transformed as data into a computer model and further processed and structured into decision support information.

IDSS development is conceptually based on ISICS which means focus on the interaction between managers' needs to make business decisions and the ability of modern information technology to provide this assistance with a minimum of complexity and sophistication. In reality this implies that the IDSS reports and output should be easy to interpret, also for users with little experience of management accounting. As an important complement to this, the IDSS concept also includes a complete training programme for managers.

Like ISICS, IDSS also addresses performance, productivity and utilization issues. In addition IDSS also provides modules for investment analysis and price setting.

## Development of ISICS into a Decision Support System

ISICS is a monitoring system that aggregates operational data from individual companies to information about companies and clusters of companies. This information is made available to decision makers on high hierarchical levels, for example at a branch organization, responsible for industry planning within that specific branch, or at a ministry of industry.

IDSS is partly a continuation of ISICS, downwards, as it monitors industrial operations and activities within the company and provides information for decision support to those managers who are financially and operationally responsible for the company. If the basic unit of ISICS is the company, the basic unit of IDSS is the product.

The development of ISICS into IDSS will affect two areas: the systems features will be modified, albeit to a lesser extent than the ISICS functions, which will be modified or replaced to meet the needs on the company level.

### Modified systems features.

ISICS is today available in a local area network version only, allowing eight users to simultaneously use the system. As IDSS will be offered also to small scale companies it must be assumed that single user versions of the system will be requested. IDSS will thus be available in a eight-users LAN as well as a single user version.

ISICS has been designed with built-in protection for misuse. A number of keys are therefore protected to avoid false data or undesired functions to be activated. In the multi-user version, three authority levels have been defined to reduce the risk of unauthorized use of vital information or the risk that basic parameters be changed by mistake. These ISICS features will be further developed in IDSS.

IDSS will offer more functions (e.g. operating indicators) than can be expected to be used at every company. The user will therefore have the option to specify, at IDSS generation time, from a menu which functions should be available. In case, at a later stage, additional functions will be required, the installation procedure will be repeated with the new functions added from the menu.



Changed ISICS functions

ISICS, developed to meet the needs for activity monitoring and decision support on aggregated levels, has functions which are only partly relevant on the company levels. And reversed, additional functions will need to be developed within the IDSS concept which have little or no relevance on higher, aggregated levels. The following table indicates which functions should be useful on the two levels:

<u>Function:</u>	<u>IDSS:</u>	<u>ISICS:</u>
Investment analysis (short term)	yes	no
Price setting of products	yes	no
Performance Indicators for		
- total factory	yes	yes
- total sales	yes	yes
- spare parts cost	yes	yes
- employment	yes	yes
- production to revenue	yes	yes
Productivity Indicators for		
- labour	no	yes
- capital	NO	YES
- equipment	no	yes
Utilization Indicators for		
- capital	NO	YES
- production time	yes	yes
- convertible currency	no?	yes
- local materials content	no	yes
Miscellaneous Indicators for		
- ratio of administration workforce	NO	YES
- ratio of production workforce	no	yes
- emergency service ratio	yes	yes
- added value grade	no	yes
- refinement grade	NO	YES
- profit margin	yes	yes
- optimal maintenance	yes	nc
- product contribution	yes	no
Reports on Operating Results		
- changes from last year	yes?	yes
- per period/accumulated	yes	yes

The basic structure of ISICS will thus remain for the activities monitoring part of IDSS. In addition, however, to the monitoring of company performance, IDSS will also have a product performance monitoring part which informs about the profit status for each product group. Result reports such as Operating Results, Changes in Operating Results, Operating Results for Period and Accumulated, Operating Indicators will be basically the same. Minor changes such as reporting periods and the possibility of reporting for different product groups will be added.

Some reports will be deleted, for example Operating Indicators for a Group of Companies. Also the company classification system, a central feature of ISICS but with no relevance in IDSS, will be deleted. Instead, a product classification system will be introduced, albeit less sophisticated than the ISICS company classification. There will be more graphic presentations of output in IDSS (bars, pies, diagrams).

A new IDSS function will be introduced, Management Guidance, with the objective to assist managers in setting adequate product prices and in analyzing short-term investment alternatives.

## II.2. IDSS Operational Features:

IDSS provides two basic types of information to the operations manager: monitoring information and guidance information.

Monitoring refers to information about how well (or how bad) the company is doing and how profitable (or costly) the different product groups are. There are different measures for this. One such measure is Performance which compares actual to planned results, e.g. sales performance. Another measure is Productivity which compares output to input, e.g. value of production compared to value of salaries. Yet another measure is Utilization which compares how much is utilized out of a given asset, e.g. actual production time out of total available time.

All these are examples of operating indicators which are calculated by IDSS and presented to the user, either directly or in graphical form. A more direct type of monitoring is provided through a number of reports such as the result report, showing actual results per period for a number of parameters (see below) or actual result compared to planned.

Also the different product groups can be monitored. The measure is here Contribution which gives the difference in value between sales price and variable costs. (Contribution means that each sold product with a sales price that is higher than the total variable costs of the product will contribute to covering the company's total fixed costs).

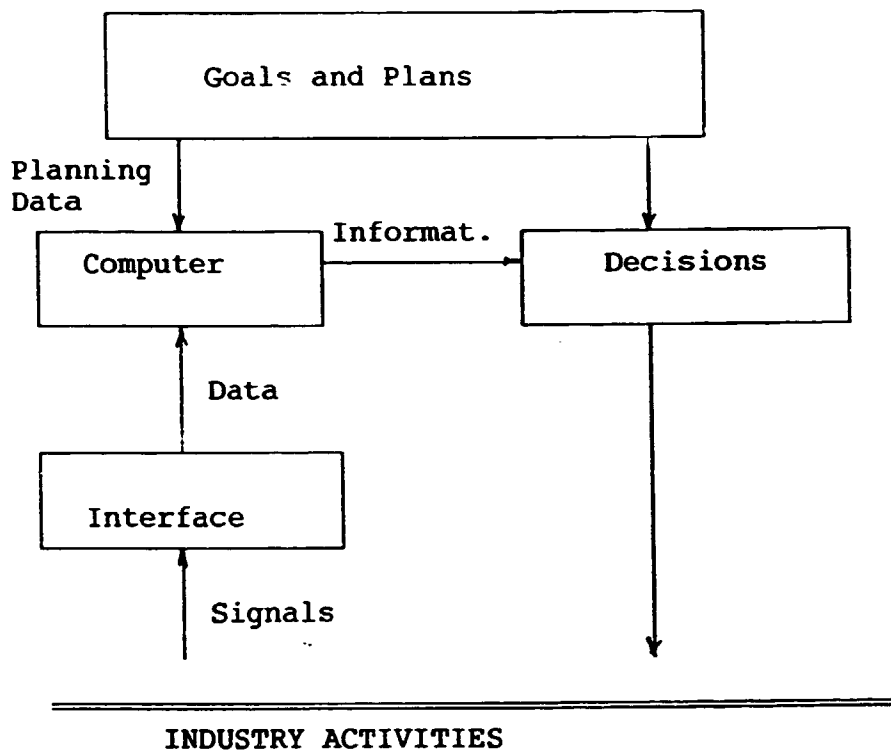
Guidance refers to the direct assistance that IDSS can give to the operations manager to assess the profitability of a future investment or to decide the sales price for one or more products or product groups.

The monitoring and guidance information and measures will now be presented in some more detail

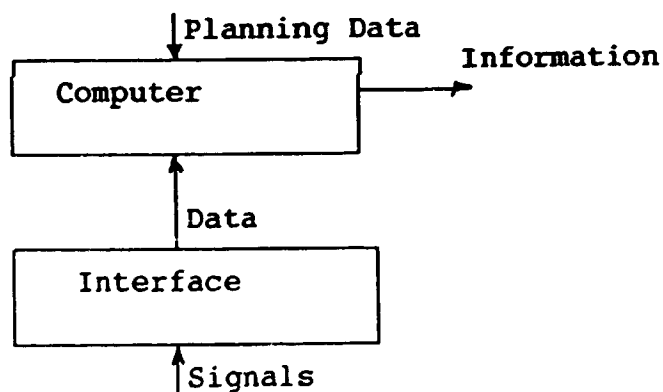
#### Monitoring.

The basic pre-condition for operating a company, regardless of what products or services it produces, is an efficient accounting monitoring system which can give information about costs and revenues, about loss or profit and about the trends of these parameters. Because without this very basic information, all planning for the future will be hazardous. Without enough knowledge about present status, any planning for the future will do!

Monitoring implies providing the decision maker with information about actual trends regarding certain parameters. But the decision maker also needs to know how actual results relates to plans. The decision support model, presented in chapter I will therefore need to be modified to serve as a proper IDSS model (next page).



The IDSS concept covers two principal parts of the figure above: the computer model to take care of data and generate information, and the interface module to collect the signals. The following two components of the figure will thus illustrate the IDSS-part of the decision support system:



The responsible manager (the small company) or the planning department (the bigger company) makes the operating plan for the coming year, one plan for the whole year or broken into periods (months or quarters of the year). This planning data is entered into the IDSS database using the Operating Plans register forms.

Signals from the actual operations, detected and transformed into data by the IDSS interface, are also entered into the IDSS database. This interface is a similar set of register forms, Operating Results, as used for the entering of the operating plans.

Based on the planned and actual data, the IDSS model is able to generate a variety of management decision support information (see below). For investment analysis, specific data has to be entered regarding interest rates etc.

#### Operating Planning data

IDSS will use the following planning (or budget) data:

- Revenue (export and domestic)
- Cost of Material (import and domestic)
- Cost of Equipment (import and domestic)
- Cost of Spare Parts (import and domestic)
- Cost of Energy
- Cost of Salaries
- Cost of Administration and Services
- Production Value
- Total Production Hours
- Total Maintenance Hours
- Convertible Currency Needs
- Estimated Sales Volume per Product Group

This will be recorded per product group and for the company for each planning period (year, quarter or month). In addition, some financial balance data will be needed such as storage values at the beginning of the fiscal year.

#### Operating Results data

Operating results will be captured and entered into the IDSS data base to be used by IDSS for different types of reports. As operating results will be compared to plans, the same type of data will be recorded (see above).

## Reports

IDSS provides a variety of parameters to be showed in the reports. While one set-up of parameters may be applicable for one company, a somewhat different set-up may be more appropriate for another. Therefore IDSS allows the user to specify at installation time what parameters to be used. The whole range of parameters are, however, at the users disposal and can be activated and included in the operations at any time after installation.

In the following, the different reports and parameters will be specified and described.

### CHANGES IN OPERATING RESULTS

This report compares the operating results between current and previous year and gives the changes in percent.

### OPERATING RESULTS FPR PERIOD AND ACCUMULATED

The report compares Operating Results (actual) with Operating plans, both for a specified period (e.g. month of April) and accumulated from the beginning of the year (e.g. for the period January to April). An index is used to facilitate comparison.

### OPERATING INDICATORS

The Operating Indicators are simple arithmetic expressions for the measuring of company performance and productivity and of resource utilization. Operating Indicators are given for the last three years, provided that data needed for the calculation has been entered into IDSS through the Operating Plans and Operating Results. The following is a list of indicators which can provide the operations manager with condensed and easily interpreted information about performance, productivity and utilization. For each indicator is suggested a reference value as a comparison with the actual value.

Some Operating Indicators (OPIs) compare year end with year start data. If there is inflation that can not be neglected as the OPIs are calculated, the result will be compensated for by an inflation factor. The inflation factor is taken as the average value for inflation during the year and calculated according to the following formula

$$\text{Inflation Factor} = 1 + p/2 * 100$$

where p is the total inflation for the year. IDSS will automatically insert the Inflation Factor to those OPIs where it is applied. If no Inflation Factor is specified, i.e. p is set to 0, then IDSS will not provide any inflation compensation.

The operating indicators are listed below:

#### TFP - TOTAL FACTORY PERFORMANCE

Formula:            (Total Sales Revenue) /  
                          (Total Production Cost)

Used to:            Evaluate total profit or loss.

Operating reference: Should be >1.

#### TSP - TOTAL SALES PERFORMANCE

Formula:            (Actual Total Sales Revenue) /  
                          (Planned Sales Revenue).

Used to:            Evaluate sales output compared to plan. Indicates how well factories can plan revenues for a coming period or how the company's products are received by the market. If this indicator is significantly less than 1 then it indicates too optimistic sales planning or that sales was hampered by other factors. A company review is required. This OPI has a built-in inflation compensation factor.

Operating reference: Should be in the interval 1 to 1,5.

#### SCP - SPARE PARTS COST PERFORMANCE

Formula:            (Actual Spare Parts Cost) / (Planned Spare  
                          Parts Cost).

Used to:            Evaluate the cost of spare parts compared to planned spare parts cost. A high ratio (>1) may indicate that the general condition of the production equipment is inadequate. A too low ratio (<<1) may indicate that too few spare parts have been acquired with the

risk of increased machine break-downs in the next future. This OPI has a built-in inflation compensation factor.

Operating reference: Should be around 1.0

#### SLP - SALARY PERFORMANCE

Formula: (Actual Total Sales) / (Actual Total Salary)

Used to: Evaluate how much total salary is actually involved to achieve the actual sales results. All employment categories should be included, i.e. production, administration, management.

Operating reference: Monitor trends with last year(s) and with other companies in the sector. Watch for over-employment, i.e. too many employees are used to reach the financial result. There may be potential for rationalizations.

#### PRP - PRODUCTION TO REVENUE PERFORMANCE

Formula: (Production Value End of this Year - Stores Value of Finished Products End of this Year) / (Production Value End of this Year. The formula is identical with Total Revenue End of this Year - Stores Value of Finished Products Beginning of this Year) / (Production Value End of this Year.

Used to: Evaluate how much of sales revenues of this year actually was produced this year and how much was sold from last year's production. This OPI is important as it indicates how much of produced volume is actually sold.

Operating reference: Should be close to 1.



## LRP - LABOUR PRODUCTIVITY

Formula:  $(\text{Total Sales Value} - \text{Total Material Cost}) / (\text{Total Salaries})$ . NB: Total Sales Value - Total Material Cost is generally referred to as Added Value, i.e. the value that the market is prepared to pay for the work done in the factory as material undergoes a process to finished product.

Used to: Evaluate how much value of work is produced from one LS of salary. Substantial investment in automation technology will generally result in increased labour productivity.

Operating reference: No value of reference can be quoted here. Should be used in comparison with other factories and branches.

## CLP - CAPITAL PRODUCTIVITY

Formula:  $(\text{Total Sales Value} - \text{Total Material Cost}) / (\text{Total Capital})$

Used to: Evaluate how much value of work is produced from one unit invested Total Capital. Improved materials control such as just-in-time (JIT) methods, less material in stores, quicker customer deliveries and control on customer payments will generally improve capital productivity.

Operating reference: No value of reference can be quoted here. Should be used in comparison with other factories and branches.

## CPU - CAPITAL UTILIZATION

Formula:  $(\text{Total Sales Revenue}) / (\text{Total Value of Raw and Semifinished Material})$

Used to: Evaluate how many times in a year the stock of material is turned over into sales. The general efficiency of a factory decides how quickly the cost of material (which is the same as lending money to the market) can be returned to the company in the form of sales revenue.

Operating reference: The higher this OPI is, the higher is the total efficiency of the company. The target should be 2 or above.

#### PTU - PRODUCTION TIME UTILIZATION

Formula: (Total Yearly Production Hours) / (Total Available Production Hours)

Used to: Evaluate how well the available production time is utilized. Too low figure (<<1) may indicate severe production problems or interrupts in material supply.

Operating reference: This OPI should be as close to 1 as possible and definitely not less than 0.8. Should be used in comparison with other factories and branches.

#### CCU - CONVERTIBLE CURRENCY UTILIZATION

Formula: (Total Cost for Import) / (Planned Need of Convertible Currency)

Used to: Evaluate how much of convertible (or "hard") currency needs, planned at the beginning of the year for the import of material, spare parts etc. has actually been used for import of material, equipment and spare parts.

Operating reference: This OPI should be close to 1. A too small figure may indicate that not enough spare parts were imported or that not enough convertible currency was allocated from the financial system with the possible result of material shortages or lack of spare parts.

## LCU - LOCAL CONTENT UTILIZATION

Formula:  $(\text{Local Material used in Production}) / (\text{Total Material used in Production})$

Used to: Evaluate how much in value of the finished products that is built upon material acquired on the local market. There is generally an industry strategy to set targets for certain branches to reach a certain percentage of local content.

Operating reference: Refer to the specific strategies that may apply for certain branches and products.

## ESR - EMERGENCY SERVICE RATIO

Formula:  $(\text{Total Number of Hours for Emergency Repair}) / (\text{Total Number of Maintenance Hours})$

Used to: Evaluate the share of emergency repair. Emergency repair, which is unplanned and therefore interrupts the production, is much more costly than planned repair and maintenance. A high rate of emergency repair may indicate generally unreliable production equipment. Experience shows, however, that well structured maintenance procedures with enough frequent preventive maintenance can significantly reduce the need for emergency repairs.

Operating references: Should be as small as possible.

## PMN - PROFIT MARGIN

Formula:  $(\text{Total Sales Revenue} - \text{Total Production Cost}) / (\text{Total Sales Revenue})$

Used to: Evaluate the profit share of total sales revenue.

Operating references: Should be  $> 0$ .

Three additional operating indicators will be included in IDSS, viz.

- discrepancy between sales revenue and actual income ("customer payments")
- ratio between total revenue from export and total costs for import
- product contribution related to imported material

### Product Monitoring

IDSS has the capacity of monitoring, in addition to the total company monitoring, also 20 individual products or product groups. For each of these products is calculated product contribution, defined as sales price minus variable costs such as material costs and those energy, maintenance, administrative and miscellaneous costs which can be assigned to the product.

For individual addressing of each product there is a need to assign product numbers. A seven digit number will be used for each product. The number will contain the international code for branch and product in addition to a company specific serial number. The international classification will be of interest for the operations manager to make comparison with external information for similar products, e.g. international prices and costs. In countries with private branch organisations, the classifications of products is often a prerequisite for organized branch support (central stores for spare-parts, central information of suppliers etc).

The concept of product contribution means that the net profit of each product, defined as the difference between price and variable costs (which needs to be positive!), will contribute to the covering of the fixed costs of the company. Product may thus be ranked according to their contribution value: a product with a high contribution value contributes more to covering the fixed costs than a product with a lower contribution value.

High contribution may, however, be less valued if it makes more use of bottle-neck resources than other products, thus preventing usage of resources (This is the basic idea behind the OPT philosophy; see I.3). In analogy with the OPT idea one should here qualify the contribution somewhat more by also indicating, in the monitoring, product contribution in relation to the hard currency portion of the variable costs. This will classify product

contribution with respect to the risk of shortage of convertible currency which can, if one wishes to stick to the OPT philosophy, be regarded as a bottle-neck!

IDSS will thus use three ranking methods for products according to their potential contribution to cover the fixed costs. The most relevant ranking strategy may differ from company to company as can be seen from the example below:

Three products are assumed.

Product one (P1)	has a contribution of	100	per unit
Product two (P2)	"	140	"
Product three (P3)	"	220	"

P1	uses	20%	of the company's imported material
P2	"	40%	"
P3	"	40%	"

(Imported material is the company's bottle-neck due to hard currency constraints).

Total sales volume of P1	is	12 000	units p.a.	
"		P2 is	15 000	units p.a.
"		P3 is	6 000	units p.a.

<u>Ranking method:</u>	<u>P1</u>	<u>P2</u>	<u>P3</u>
product contribution per unit	100	140	220
total product contribution in % of total contribution	26	45	29
total product contribution in % of import material	1,3	1,1	0,7

The example shows that each of the three products can be regarded as the most profitable, depending on the chosen analysis method. (P3 in the first ranking method, P2 in the second and P1 in the third).

### Guidance

The meaning of Guidance is that IDSS provides the operations manager not only with monitoring information but also with decision alternatives. Of course can the manager decide to follow an other alternative. IDSS is for decision support!

IDSS provides guidance to the operations manager in three situations, viz. in short term investments, for price setting and for the optimization of maintenance frequency. A short description of the three IDSS functions follows below.

#### SHORT TERM INVESTMENTS

The most crucial question confronting an operations manager who is about to make a decision regarding an investment in, for example, new production equipment is: Can this investment be economically justified? The complexity of the question comes from the fact that many parameters interact and create the uncertainty. The basic question can be reformulated as How much revenue increase is needed to cover the extra costs for the investment? If the manager has an answer to this question, his decision has been reduced to a marketing question: Is the market potential there or Will the market accept a higher price?

The IDSS investment analysis model focus' on the cash-flow and short-term benefits rather than on long-term capital conditions of the company. The more detailed and strict investment analysis, requested for financial control in medium and big companies, is not satisfied by the IDSS model. As a tool to guide the manager in a decision situation about an investment the IDSS model has, however, certain credits: it gives instant answers, different alternatives can be simulated and it can calculate the optimal borrowing time for bank loans.

IDSS will need the following parameters to perform the investment analysis:

- estimated costs for the coming year
- estimated increase in revenue as a result of the investment for the same period
- investment sum
- if external bank loan: number of years
- interest rate of external loan

IDSS uses an analysis model where the two ratios "revenue to costs", one without the investment, one with the investment, are compared. If the comparison gives that the ratio of the ratios is greater than one, then the investment can be economically justified.

Testing with different values of the input parameters means that the IDSS investment tool can also be used as an investment simulation model and assist the operations manager in evaluating different scenarios. For example, how much must revenue increase if the interest rate goes

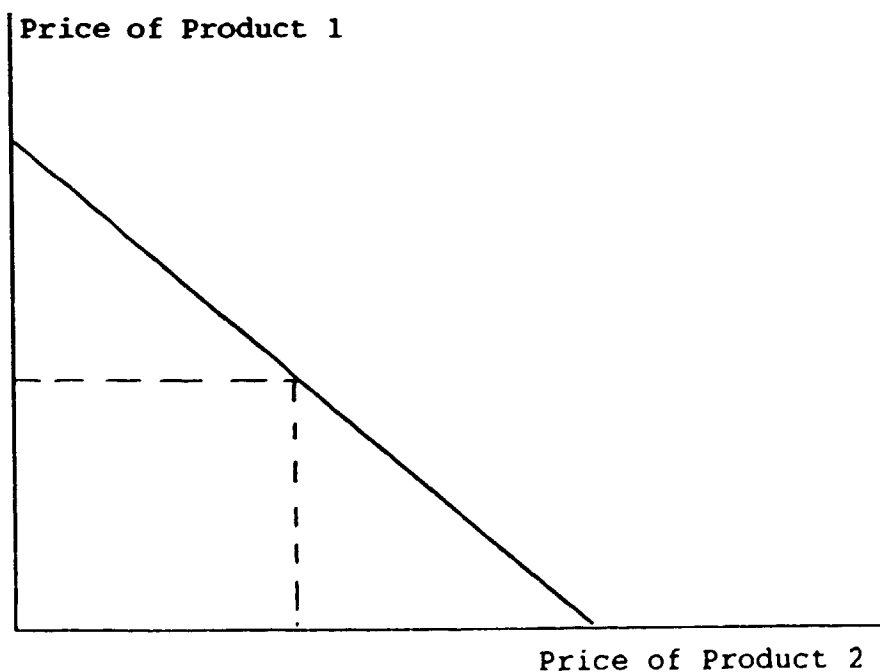
up by  $x\%$ . Or, which of two investment alternatives is the best if estimated revenue can only be increased by  $y\%$  through the investment.

#### PRICE SETTING

For the small company with only one product, the question of product price is relatively simple: the products contribution, i.e. product price minus variable costs, must be sufficient to cover the company's fix costs.

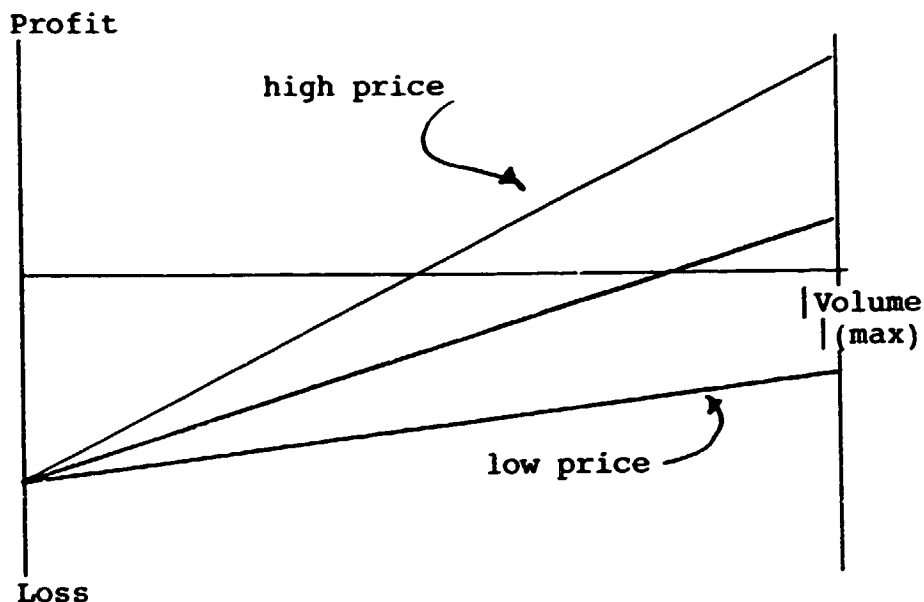
But in most companies there are more than one product and with different variable costs for the products, the price setting becomes a question of optimization. The IDSS approach to the problem is the following: the sum of the total yearly contribution from all products, i.e. contribution multiplied by sold volume, is compared with total yearly fixed costs. Simulation with different product prices will guide the operations manager to find an adequate price level.

The method, applicable for all the twenty products allowed by IDSS, can be illustrated for two products as follows:



The line ("indifference line") indicates total company loss to the left, total company profit to the right of the line. With a given price for Product 2 and with the help of the indifference line we can thus draw the conclusion from the figure what price will be needed for Product 1 in order to avoid a loss. Increasing the price for Product 2 will allow a somewhat lower price for Product 1 etc. The IDSS will make this analysis for up to twenty products.

The product price is based on the assumption that a certain volume will be produced and sold, often at maximum production capacity. If only a lower volume can be produced because of production interrupts, missing material etc, IDSS can propose a price adjustment, based on the following figure:



The figure shows how total product contribution increase with increased volume sold. Depending, however, on the price, the product contribution may or may not be sufficient to cover the fixed costs and lead to profit in case the volume is reduced. IDSS will be able to determine what price adjustment is needed to compensate for a reduced sales volume.



### MAINTENANCE FREQUENCY

It is well known that emergency repair of production machinery is more costly than if the repair can be scheduled in advance. The reason is that unplanned production interrupts cause disturbances in production planning, materials supply and customer relations. This can be avoided through a scheduled maintenance programme with scheduled repairs which will cause temporary, but foreseen, production interrupts. Too many such interrupts will, however, have similar effects as with emergency stops. In addition there will be costs for the administration of this maintenance service. It is therefore possible to optimize the maintenance frequency (for a detailed discussion of this subject, see for example Lind, 1991).

IDSS provides the operations manager with an estimation what should be the most economical maintenance frequency. The figure given is calculated from available input data and should be seen as a guidance. A compromise with the actual production conditions may be needed to get the best solution. Due to the nature of this optimization problem, there is normally little difference between optimal or near optimal strategy.

### II.3. IDSS User Interfaces

Four types of interfaces can be identified between the IDSS and its users, viz.

- the User's Manual which describes how to operate IDSS
- the IDSS user training for proper implementation
- IDSS input forms
- IDSS output reports and information presentation

#### IDSS User's Manual

The IDSS User's Manual will have the same basic layout as the ISICS User's Manual, presented in Appendix A. It will thus show the IDSS System Requirements in terms of hardware and software as well as how the IDSS database and files are organized.

The Manual's Installation Guidelines will in detail describe how the IDSS programmes are installed in the

user's computer, how the desired reports are selected, how to adapt to existing VDUs and Printers and how to arrange, based on the actual local area network configuration, the different authorization groups (does not apply to the single-user version).

The manual also gives the instructions how to operate IDSS regarding data entry, how to select reports, how to assign product numbers etc.

Finally, the manual describes the basic IDSS functions together with the underlying theories and formulas.

### IDSS User Training

Efficient methods and modern principles for business accounting and for the design of decision support systems is an area that attracts increasing attention in research as well as among practitioners of management and organization theory. There are many reasons for this. Successful companies, small as well as big ones, have shown, through case studies and research, that high attention to market needs, cost/benefit analysis showing the real costs and a conscious and goal-oriented business planning lead to good results. As these "new" demands can not be addressed through conventional and out-dated accounting methods, stemming from the beginning of the century, new concepts have been developed.

The basic business control principles are well known to any crafts-man in any small shop in any country: the revenue coming in from selling products or services must be high enough to cover the costs. As long as the crafts-man runs his business alone, perhaps together with a son, his overview of the business is complete and enough to observe anything that will require his action. As, however, business expands and becomes more complex the overview becomes less transparent and needs shift from an ad hoc alert system to a method where activities can be tracked and the significance of events can be evaluated.

Already at a relatively moderate expansion level, the monitoring of company activities through a variety of data becomes complex. With growing business, the significance of this information grows and becomes more and more important for planning as more and more value is involved in production, invested capital and customer relations.

A most important pre-requisite for successful use of a formal decision system like IDSS is therefore that the users fully understand the features and functions of IDSS. But what is even more important is that the user is fully aware of the nature of his own profession: that he has proper cause/effect understanding, that problems are correctly identified and that proper solutions are applied. It is not until this awareness is complete that full use of IDSS can be expected.

The IDSS training will therefore concentrate on two basic issues, viz.

- the basic functions of a market driven company in relation to its three markets: the resource, the financing and the products markets and how the performance of the company is controlled and developed in interaction with these markets.
- the function of IDSS and how the company can benefit by its use.

The training is envisaged for groups of companies within a region and will typically be in the form of one-week courses with hands-on training and cases.

### IDSS Input

Three types of input will be required for the operation of IDSS, viz.

- Registration of inflation factors, of reporting periods and of products numbers. This registration is under the responsibility of an assigned IDSS coordinator.
- Operating plans and operating results are reported, using pre-designed reporting forms or reported directly into IDSS.
- In connection with investment analysis, IDSS will require actual data on interest rates and other data regarding the actual investment.

Procedures for reporting and the question of responsibility that correct data be entered into IDSS will be a topic during the IDSS training.

## IDSS Output

The different reports such as Changes in Operating Results and Operating Results for Period or Accumulated can either be printed on paper or on a VDU screen. The same applies to the Operating Indicators and the graphical presentation.

The Operating Indicators should be used extensively as they are easy to interpret and have a significant information value. The description of each Operating Indicator (given in the IDSS User's manual) should be well known to the operations manager so that proper use can be made of the reference values associated with each Indicator. This will make full use of IDSS' capability as a decision support tool.

## II.4. IDSS Users and User Benefits

The private sector is continually growing in most countries, not least in the third world and in those regions which undergo a transformation from planning to market economies. Although a major part of the private sector companies is still small in number of employees and in economic turnover, the number of medium scale companies is increasing due to the privatization process in the public sector.

The growth of the small and medium scale industry sector is of vital importance for industrial development. A pre-condition for this growth is the presence of a market with enough potential and a government policy that fosters entrepreneurship. But in addition to these and other external factors to facilitate industry growth from the low end, there are equally strong requirements for efficiency in internal key conditions such as management skill and business planning and control.

IDSS is thought to be a tool to reinforce this internal efficiency by stressing certain basic areas, for example:

1. Management Accounting is the basis for all management control in industry. Many of today's management accounting computer systems are, however, inappropriate for use in small and medium third world industries, either because they are based on less adequate

parameters or because many managers in industries are not familiar with basic accounting principles being used in the sometimes sophisticated software. IDSS will emphasize on simplicity and pedagogic presentation of information.

2. Simulation and analysis of investments in for example production equipment is an important decision support tool. IDSS provides this tool to managers as a guideline how the financial performance of a company will be affected by the investment.

3. Insufficient experience and knowledge about modern business control and management accounting principles reduces the ability among managers in third world industries to cope with many significant business problems. IDSS, being particularly designed with this in focus, helps the manager to monitor key business parameters through the use of operating indicators and graphic presentation.

4. The combination of a ready-to-use software and a training course which places the software in its proper context, gives the user a very good opportunity of becoming familiar with the functions of IDSS and their applicability to the user's own business environment.

5. IDSS is well suited for management training, both on university levels and in vocational training, through the possibility of simulating different business/industry scenarios and evaluating the results, using the operating indicators.

The objective of IDSS is therefore to support managers in the small to medium range of companies to make and follow up business plans and to improve their management ability and skills.

Although the functions and features of IDSS are intended for the small and medium scale industry, the needs can be assumed to vary within this range and not necessarily all of the IDSS functions are essential for all company sizes. The option to select desired functions at installation time can therefore be useful.

The following table gives an indication about what IDSS functions should be particularly relevant for the different company sizes.

	SMALL INDUSTRY 10-50	MEDIUM INDUSTRY 50-100	MEDIUM INDUSTRY 100-500	LARGE INDUSTRY 500-
<u>Monitoring:</u>				
Performance OPI	*	*	*	*
Productivity OPI			(*)	*
Utilization OPI		(*)	(*)	*
Operating Results, changes			(*)	*
Operating Results, period and accumulated	(*)	(*)	*	*
Product Contribution	*	*	*	*
<u>Guidance:</u>				
Investment Analysis	*	*	*	*
Price Setting	*	*	*	*
Maintenance Optimization			(*)	*

\* indicates relevance, (\*) indicates probable relevance.  
(OPI stands for Operating Indicators).

It should be underlined that the table is of course very rough and should be seen as a general guideline only. As companies vary in complexity due to products and production system and as the degree of management ability varies, the need for decision support tools will vary as well. The suggested size range of companies may furthermore be appropriate in one country whereas in another country already a 100-employees company should belong to the large company group. In spite of this, the grouping of companies can be used as a pedagogic tool to illustrate how needs may differ due to company size.

### PART III: RECOMMENDATIONS TO UNIDO

This chapter has the following content:

- Introduction
- IDSS Development Programme
- Dissemination to Users
- Project proposal

#### Introduction

The Industry Decision Support System, IDSS, concept is intended to become an important tool for industry managers in developing countries. Its cost accounting module will thus help managers to spot inefficiency in their companies and to take action. Its investment analysis module, designed as a guide for short term investments in production equipment etc, will help managers to evaluate investment alternatives and to make the choice that yields the best return in total company performance. And its aspiration to be an easy-to-use tool is accomplished through the implementation of indicators to facilitate operations monitoring, and graphics to visualize results in a form that can be easily interpreted.

Experience from earlier attempts to introduce computer based management tools in industry in developing countries shows very clearly that a mere computer program alone is seldom enough to improve the quality in decision making. There are additional needs in the form of training and installation support. Management training is therefore of vital importance as it will facilitate for managers to grasp the features and functions of IDSS and, in particular, to show how these functions can help the managers to make better decisions.

It is therefore suggested that IDSS be provided to users as a package consisting of the IDSS software, a workshop and installation support.

It is here strongly recommended that UNIDO undertakes the responsibility for the development and dissemination of the IDSS package. There are two main reasons for this:

1. IDSS is particularly intended to strengthen management capability in small and medium scale third world industries, not least in the private sector. IDSS will therefore have the potential of contributing to increased efficiency and competitiveness in the industry sector. This is also a central issue of the UNIDO programme.

2. UNIDO plays an important role in the introduction and dissemination of information technology in developing countries and has developed an adequate infrastructure for this purpose. The Technological Information Exchange System (TIMS) is one example of this infrastructure which could be utilized for the dissemination of IDSS.

### III.1. IDSS Development Programme

The development of the IDSS concept has two parts - design and development of the IDSS software and design and development of the IDSS user training programme. The two parts have the following main activities:

#### IDSS Software Design and Development

1. Design of the IDSS software will be based on existing ISICS software and on the IDSS functions described in section II of this study. This is a time and cost saving approach as the design and development of ISICS as well as the installation in a developing country contributes valuable experience to the IDSS project.

Upon completion of the design phase, a reference seminar should be arranged at a suitable location, for example at the department of Industrial Economics and Management at the University of Linköping, Sweden, which has a significant research record on management and organization development in third world industries.



The output of the design phase should typically be a detailed description of IDSS functions, design of reports and graphs, how to operate IDSS, data input requirements, which software development tool to be used (Symphony, Lotus etc).

2. Software coding, using a software development tool.
3. Extensive testing of IDSS software.
4. Development of an IDSS User's Manual. The manual will contain general systems requirements, guidelines for the installation of IDSS, instructions to the operator and a description of IDSS functions. The design and lay-out will follow that of the ISICS manual, attached as Appendix A.

#### IDSS User Training Programme

1. Design of training package (scope and content, syllabus).
2. Development of course material (write course literature, develop case studies).
3. Make a course plan.

#### TIME ESTIMATE FOR DEVELOPMENT WORK

Two professionals will be involved in the IDSS development work, an expert/project leader and a software analyst. The project leader should be an expert in industrial economics and management with substantial experience from working with industry management projects in third world countries. Also thorough experience of the application of computers in third world industries is required. The software analyst/programmer should be well experienced in the development of management information systems on IBM-compatible personal computers. He should also have good experience of system development work, using modern spread-sheet techniques.

1. Time estimate for IDSS software development:  
(man-days)

	<u>project leader</u>	<u>programmer</u>
Design of IDSS	15 mandays	5 mandays
IDSS software coding	10 mandays	60 mandays
IDSS User's Manual	10 mandays	5 mandays
Testing	10 mandays	10 mandays
Miscellaneous	5 mandays	

## 2. Time estimate for IDSS user training material:

### project leader

Course syllabus design	5 mandays
Writing of course material	30 mandays
Course structure and lay-out	5 mandays

Total time estimate: 170 mandays (90 for project leader, 80 for programmer).

### III.2. IDSS Dissemination to Users

There are two target groups which are the most important to reach with information about IDSS: potential users and local agents for the dissemination of information within a country or a region. The potential users are

- private companies in the industry sector
- industry companies in the public sector
- vocational management training institutes
- university departments of business and management

The potential users should primarily be found in the small and middle range of companies.

Potential local agents are

- software houses  
(e.g. Schoemans in Namibia, SCAP in Congo)
- industry branch organizations  
(e.g. KMAP in Kenya, GOFI in Egypt)
- chambers of commerce

A rough estimate of the number of small and medium scale companies which are potential IDSS users is not easy due to great variations in statistics. Official sources (GOFI) in Egypt, for example, estimate 22,000 small and medium companies. The number of potential local agents is less difficult to estimate. A few examples: Congo counts 3 software houses and 2 industry organizations. Official software houses in Egypt are 69 and 17 industry/branch organizations. Numbers for Namibia are 4 and 2 respectively.

It will be of paramount importance that IDSS be brought to the cognizance of the potential users and that the functions and benefits of IDSS be clearly presented.

For a more general presentation of IDSS, the following list of activities is suggested:

within the frames of a regular COGIT workshop at UNIDO with informatics experts with experience from developing countries: focus on benefits and needs of information systems in third world industry with discussions around IDSS as a dedicated and modern software tool. Items to be discussed should concentrate on dissemination and promotion.

an article about IDSS should be published in UNIDO's Microelectronics Monitor which is widely spread in developing countries.

IDSS presentation in the Technological Information Exchange System (TIES).

For more dedicated presentation of IDSS, a series of workshops should be locally organized. Each workshop should typically last for one week with an audience of small and medium scale business managers as well as local software consultants as future potential IDSS disseminators. Invitation by local UNIDO offices. It is recommended that two countries be selected as a test and that two workshops be run in each country. After the test period there is an evaluation before a further workshop programme is decided.

### III.3. A Project Proposal

#### 1. BACKGROUND AND JUSTIFICATION

The private sector is continually growing in most countries, not least in the third world and in those regions which undergo a transformation from planning to market economies. Although a major part of the private sector companies is still small in number of employees and in economic turnover, the number of medium scale companies is increasing due to the privatization process in the public sector.

The growth of the small and medium scale industry sector is of vital importance for industrial development. A pre-condition for this growth is the presence of a market with enough potential and a government policy that fosters entrepreneurship. But in addition to these and other external factors to facilitate industry growth from the low end, there are equally strong requirements for efficiency in internal key conditions such as management skill and business planning and control.

The partly new principles involved in doing business in a private company compared to state owned enterprises derives from the fact that the company's economy must be under strict surveillance and control. Investments must be profitable and costs must be balanced with revenues, at least on the average.

Managers must not only be aware of these needs, they must also be able to carry out management control. This management control has a number of components: The manager must understand which accounting parameters should be used for productivity monitoring and which should be used to monitor business performance. Certain parameters are for example more useful for the measuring of resource utilization while others provide more general information. And with appropriately structured information that highlights changes and unexpected events, the manager will have an efficient tool for decision support. This again is of vital importance for the private enterprise to enable fast reaction to market trends, to spot internal inefficiency or to find an optimal investment strategy.

Computerized systems for management decision support have been in use for many years in the industrialized countries and a number of sophisticated computer models have been developed for this purpose. A report on the impact of information technology in Asian government

systems, presented by the Management Development Programme of the British Commonwealth Secretariat (1987) showed that among the more important applications were also decision support systems:

These integrate the components of information retrieval systems, databases and decision models to provide interactive support systems for decision makers. Such systems are likely to grow and would form the future trend for the design of computer based information systems in the government as more and more managers in government start using computers.

Due to technological constraints, these systems were first available only on large main-frame computers in the industrialized countries. With the microtechnology development, decision support systems for managers can now be available at a fraction of previous costs.

The present project is a step to

- (a) improve competitiveness among small and medium scale firms in developing countries through better cost control and optimal product strategy
- (b) improve decision support capability of managers in small and medium scale industry firms in developing countries
- (c) promote the use of computer technology as a management tool in small and medium scale industry in developing countries

## 2. THE PROJECT

### (a) Project objective

- (i) To design and develop an activity monitoring and decision support system for personal computers to be used by operations managers in small and medium scale industries in developing countries. The design is partly based on the Industry Sector Information and Control system, ISICS, developed for similar purpose to be used on ministry levels and already in operational use

- (ii) To design and develop a training course for industry managers to be used in combination with the system in (i) to pave the way for its successful promotion, implementation and use

(b) Output(s)

- a) A computer software package, Industry Decision Support System, IDSS.
- b) An IDSS User's Manual
- c) A complete training course including case studies, hand-out material and IDSS interface to be used for management training and IDSS promotion

(c) Activities

<u>Phase</u>	<u>Duration</u>
I. Design of IDSS software	1 month
II. IDSS programming	3.5 months
III. Completion of an IDSS User's Manual	1 month
IV. IDSS testing	1 month
V. Development of a training course	2 months
VI. 2+2 workshops for industry managers	1 month

(d) Inputs

## (i) UNIDO inputs

## (1) Experts

		<u>m/m</u> <u>USD</u>
(i)	One international expert in industrial management and third worlds informatics experience for phase I (part of), II (part of), III (part of), IV (part of), V and VI	5.5 47,000
(ii)	One international software expert in software production for phase I (part of), phase II (part of), phase III (part of), phase IV (part of)	4 24,000
(iii)	Travel costs and DSA for phase VI	9,000
	<b>TOTAL</b>	<b>USD 80,000</b>

**3. REPORTING AND EVALUATION REQUIREMENTS**

A detailed report with participation input will be prepared after the four test workshops.

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APPENDIX A

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**INDUSTRY  
SECTOR  
INFORMATION  
CONTROL  
SYSTEM**

# ***ISICS***

## ***USER'S MANUAL***

- \* Systems Requirements***
- \* Installation Guidelines***
- \* Operating Instructions***
- \* Functions Description***

## ISICS

### INDUSTRY SECTOR INFORMATION AND CONTROL SYSTEM

ISICS is a set of computer programs for the monitoring of industry performance. It has three main functions: to establish a structured register for companies, to enter, periodically, operations data for each company and to provide management reports on company performance. The focus of ISICS is thus on operating activities.

ISICS is cash-flow oriented in the sense that performance of a company should primarily be measured by revenues from sales rather than from value of production. The basic philosophy of this is simply that production will not generate income to the company until it is sold on the market.

The Operating Indicators, a set of key-factors which are central in the ISICS design and used for the monitoring of industry performance, thus take into account sales achievements in addition to production results.

This documents contains the following information:

- ISICS Systems Requirements
- ISICS Installation Guidelines
- ISICS Operating Instructions
- ISICS Functions Description

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APPENDIX 1: ISICS Reports and Working Documents

APPENDIX 2: Branch - and Product Codes

## I. ISICS SYSTEMS REQUIREMENTS

ISICS is developed from Lotus Symphony.

### I.1. Hardware Requirements

#### I.1.1. Internal memory.

ISICS requires 640 kB as basic or conventional memory. In addition, expandable memory modules may be required if the number of registered companies exceed 1000. It can be expected that each registered company occupies about 200 bytes of internal memory.

It should be noted that these memory requirements apply to each work-station (PC) attached to the ISICS network.

#### I.1.2. External memory.

ISICS programmes require about 6 MB of disk capacity (5,76 MB to be exact) plus additional 20 kB for data files for each registered company.

For 150 registered companies the total hard disk requirements on the server, for eight users, are about 9 MB.

#### I.1.3. Diskette reader (Floppy disk drive).

To copy the ISICS programmes and files onto the server (or, in a single-user version, to the stand alone work station), a conventional 3.5" HD 1,44 MB diskette drive is required.

#### I.1.4. Additional devices.

ISICS supports the following devices:

Screens:           Hercules,            EGA  
                  VGA (default),    Toshiba

Printers: HP 2886 Laser Series

## 1.2. Software Requirements

ISICS is built on the structure of Lotus Symphony and is thus subject to the software requirements of Symphony. Operating system is thus

MS/DOS, release 3.1 and later.

ISICS is thus also compatible with the following local area network software:

Banyan VINES  
IBM PCLan  
3COM3 + Share  
Novell NetWare.

User authorization in ISICS (in a multi-user environment) is, however, in accordance with the principles used by Novell NetWare.

## 1.3. ISICS Files Organization

ISICS uses the share file philosophy which means that all users share a common file for data storing etc. Each user can therefore simultaneously view the same data segments. To enter data, however, only one user at a time has access to a specific file and while this file is open for updates, it is locked for other users to enter data to the same file.

## II. INSTALLATION GUIDELINES

This section will give you the necessary information to successfully install and execute your iSICS software. Please note that the different steps during installation may differ somewhat depending on whether you intend to use ISICS in a multi-user or single-user environment. These differences will be specified in the text below. Please also note that ISICS has been developed as a multi-user system for a local area network (LAN) environment. ISICS can serve up to eight simultaneous users.

These installation guidelines have the following steps:

1. Copy ISICS modules and files to the server
2. Assign user authorization to ISICS directories
3. Specify path-ways for users
4. Specify type of screens
5. Specify printer address
6. Test-run of ISICS

### II.1. Copy ISICS modules and files to the server.

The ISICS programme modules and files are delivered in four diskettes, numbered ISICS #1, ..., ISICS #4. Diskette #4 is the starter diskette.

Installation follows the steps below:

1. Load diskette #4 in diskette reader A: (or the proper address used by the system)
2. Set the system in the mode to read from A:
3. Type INSTALL A: X: where X: is the logical device in the server where ISICS is to be installed

N.B. In a single-user version, the logical device address is likely to be C:

4. You will now be prompted during the whole installation process to shift to the other diskettes as follows: after ISICS #4 the system will ask you to insert ISICS #1, then ISICS #2, then ISICS #3 and, finally, ISICS #4 again.
5. After successful copy of all the modules and files, the system will inform you.

6. Make sure that all ISICS directories have been loaded properly in agreement with the following structure (use the MS/DOS utility function TREE):

```

\LOTUS          \SYM22
                \APP

\LOTSHARE       \SYMPHONY.V22

\USERS          \USER1
                \USER2
                \USER3
                \USER4
                \USER5
                \USER6
                \USER7
                \USER8

\ISICS          \OPI

\ISICSSYS

```

## II.2. Assign user authorization to ISICS directories.

N.B. This section does not apply to a single-user system.

ISICS allows three different user groups for selective access to the directories. The three authorization groups have the following rights:

Authorization Group 1: - Specify currency  
 - Specify Inflation Factor  
 - Specify Reporting Periods  
 - Register Companies  
 - Enter Operations Data  
 - View Reports

Authorization Group 2: - Enter Operations Data  
 - View Reports

Authorization Group 3: -View Reports

The following table shows how to give network specifications to set the authorization rights (next page):



DIRECTORY	GROUP 1	GROUP 2	GROUP 3
ISICS	all	all	R / F
ISICSSYS	all	R / F	R / F
LOTSHARE	all	all	all
LOTUS	all	R / F	R / F
USERS	all	all	all
ISICS / OPI	all	all	all

R = Read; F = File Scan

### II.3. Specify path-ways for users.

As each user must have a path-way to find the ISICS directories and files, the AUTOEXEC.BAT file should be modified as follows:

Current Path should be extended to include

```
...X:\lotus\sym22;
```

where X: denotes the logical device where the ISICS modules will reside, for example the server.

N.B. In a single-user version, the logical device address is likely to be C:

### II.4. Specify types of screens.

ISICS supports the following common screen types:

- Hercules
- VGA (default)
- EGA
- Toshiba

If all screens in your system are of VGA type, you need not specify screen-type as VGA is automatically assumed.

If one or more screens are of a different type than VGA you need to specify this during the installation procedure by giving the following command:

- For Hercules the command is HH
- For VGA the command is VC
- For EGA the command is EC
- For Toshiba the command is TC

To select one of the non-default screen-types for all users, for example Toshiba, do the following steps:

1. Shift to user directory: cd X:\USERS
2. Type TC
3. Enter

To select one of the non-default screen-types, for example Hercules, for one user only, for example User1, do the following steps:

1. Shift to user directory; cd X:\USERS
2. Type COPY ISICS\_HH.SET X:\USERS\USER1\ISICS.SET
3. Enter

#### II.5. Specify printer address.

ISICS routes all print-outs via the Parallel 1 interface.

#### II.6. Test run of ISICS.

ISICS can no be started through the following command:

1. Shift to the USERS directory: cd USERS
2. Shift to respective user-directory: cd USERn  
where n is equal to 1,2,3,4,5,6,7 or 8.
- 3: Type ISICS
- 4: Enter

N.B. In a single-user version, use USER1.

### III. ISICS OPERATING INSTRUCTIONS

This section will show you how to get access to and use the various ISICS functions. ISICS directories and data files reside in the server station (in the multi-user version) and are accessible from all the connected workstations. For detailed instructions about logging on to the network, please refer to the local system operating instructions.

#### III.1. ISICS Functions

The first ISICS image to appear on the screen shows the Main Menu, i.e. the six main ISICS functions, viz.

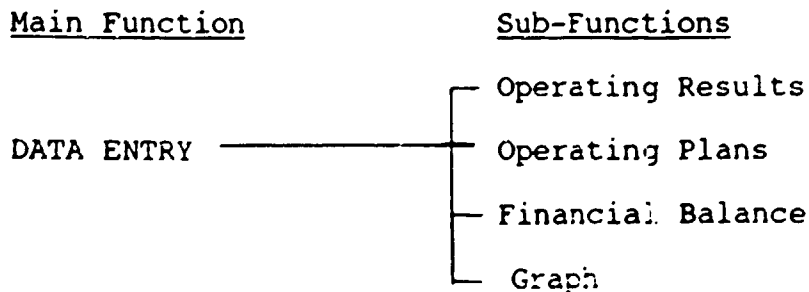
- Data Entry
- Reports
- Registration
- Service
- OPI Groupings
- Exit

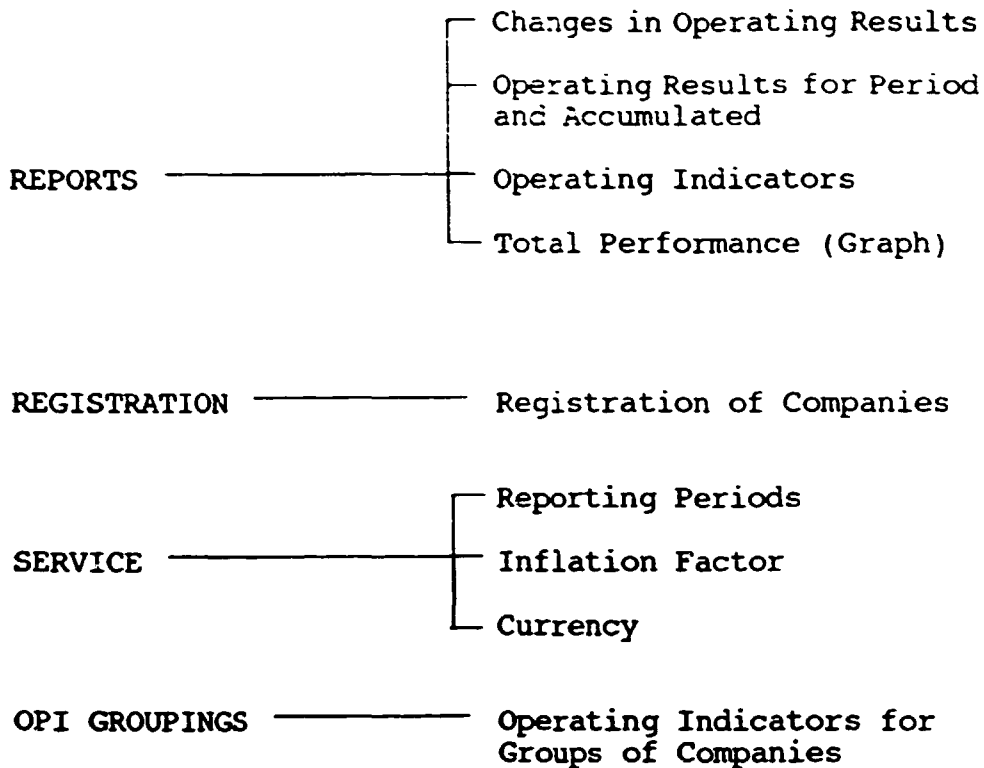
By moving the cursor to the desired function or selecting the desired function by typing the preceding number and pressing enter, the function will appear on the screen. Each function has a number of sub-functions as described in section III.2. below. Further below follows also in detail the procedures how to reach the different ISICS sub-functions.

It should be noted that the use of certain functions such as the registration of new companies requires a higher authorization code than just viewing a report (see installation guidelines).

#### III.2. ISICS Modules and Files Structure

The functions and sub-functions of ISICS are organized hierarcially as follows:





### III.3. The Menues

Different ISICS functions such as Registration and Data Entry are thus found in the menus and sub-menus. In addition, there are help-menus which are used in combination with Sub-Menus to select companies, to enter actual year, to print a report etc. In this section we will describe the main menus and the sub-menus in some more detail and, in particular, how to access and move between menus.

Access to main-menu functions such as Registration is simply achieved by placing the cursor on the function or to enter the number preceding the function, e.g. 3.

Access to the sub-functions is through the sub-menus. For the Service functions you will directly reach the sub-menu where one of the three functions, indicated in II.2., can be selected. For the Registration and OPI Grouping functions you will directly reach the form for company registration or the forms needed to make OPI inquiries for companies (OPIs are described in more detail in section III.8 and IV.3).

To reach the sub-menus of Data Entry and Reports, you are requested by the system to first enter the year for which you wish to enter data or view a report. Default year is current year. After this you are asked to select the company for which you wish to enter data or to view a report. There are two options: ENTER ID= allows you to directly enter the company's identification number (for identification numbers,

see section III.5: Registration) and reach the sub-menu. Or you may use LIST to get the listing of all registered companies with their identification numbers. By placing the cursor over the desired company and pressing enter you will reach the sub-menu.

You may leave a sub-menu or a help-menu by the QUIT command. To return to the sub-menu from a working document, just use the F10 function key.

Please note that F10 is the ISICS function key used to move between working documents and sub-menus.

To leave ISICS, use EXIT in the main-menu.

### III.4. The Service Function

By moving the cursor to SERVICE (or simply enter the number before SERVICE, i.e. 4) and using the return key, a sub-menu will appear as the top line of the screen. The sub-menu contains the following functions:

- Currency
- Inflation
- Periods

#### III.4.1. Currency.

As ISICS uses local currency in reports and for data entry, the international three-letter abbreviation for the currency (e.g. SEK for Swedish Kroner) should therefore be entered into the system.

#### III.4.2. Inflation

In those situations where inflation is significant and where cost or revenues are compared between year start and year begin, results may be misleading or incorrect unless the influence from inflation is taken care of by the system. For this purpose, ISICS uses the Inflation Factor. (This factor is described in more detail in section IV.1).

ISICS allows you to choose an inflation percentage factor from 0.0% to 900.0% for each of the years from 1991 until 2009 by simply placing the cursor in the actual inflation column and enter the inflation rate. Different rates may be entered for different years. After specifying the desired inflation rates, press F10 to calculate and save your inflation factor.

Please note that an inflation factor may be entered after data has already been registered. In this case those reports which have inflation compensation (not all reports need to be inflation compensated) will be re-calculated to reflect the inflation-compensated value.

### III.4.3. Periods

Operating Plans and Results are often given per period. Most common is the monthly period as the operating year has twelve months. ISICS allows twelve periods per year or, alternatively, one period per year (i.e. a period equals a whole year).

It should, however, be noted that in those situations where the process of collecting and forwarding operating data is a lengthy process, sometimes exceeding many months, then the one-month reporting period may be too short. In this case, the one-year period is recommended until the data collection routines have been improved.

### III.5 The Registration Function

By moving the cursor to REGISTRATION (or simply enter the number before REGISTRATION, i.e. 3) and pressing the return key, the new screen that appears will ask you to select year. If you, as an example wish to enter data for a previous year, you enter this year in the form 19XX and press enter. If you wish to enter data for the current year, just press enter. Please note that ISICS keeps data for each registered company for 3 years.

The next screen shows the working document used for the registration of a new company or changing data for an already registered company (ENTERPRISE CLASSIFICATION):

*--*--*--ENTERPRISE CLASSIFICATION--*--*--*			
IDNR ( 11345 )			
ORGANIZATIONAL BELONGING	1	SECTOR CODE	1
BRANCH CODE	1111		
PRODUCT CODE	11		
TYPE OF ORGANISATION	1	SERIAL NUMBER	345
AREA CODE	222		
EMPLOYMENT SIZE	2	PERFORMANCE (OPI D1)	2
NAME	FACTORY	_____	
STREET	STREET	_____	
PO BOX		_____	
ZIP CODE		_____	
CITY	CITY	_____	
TELEPHONE		_____	
FAX		_____	
TELEX		_____	
DATE OF ENTRY		_____	

ISICS will place the cursor in the first data field, i.e. Organizational Belonging, and wait for you to enter the appropriate code. All the codes used for this working document are found in the CODELIST FOR COMPANY REGISTRATION in section IV.2. A list of Branch and Product Codes, also used for registration, are found in Appendix 2.

When the first code (Organizational Belonging) has been entered by using the Insert or Enter key, ISICS will place you in the next field, Sector. The same procedure is then repeated until all data fields are completed.

Please note that you may back-step to make corrections as long as you are in a data field. You are, however, not allowed to go back to an already completed data field. In that case you must continue (use the Return key) to the end of the document and then again from the beginning until you reach the desired data field.

As you will notice, ISICS creates a 5-digit unique company identification number that appears in the top-centre data field as soon as the three data items Organizational Belonging, Sector and Serial Number have been entered.

REGISTRATION has a help-menu with the following three functions:

- Save, - Input, - Quit.

SAVE is used to save all registrations which have been entered during a registration session.

INPUT allows the user to resume registration after saving data.

QUIT takes the user back to the main menu.

In case you wish to delete an already registered company, place yourself in the registration form of this company and press the DELETE key. ISICS will now ask you if you really wish to delete. If YES, just type Y or place the cursor in the YES field and press enter.

To insert a company record before continuing to enter the next company, use the INSERT function key.

It should thus be noted that more companies may be registered, using the INSERT function key, before finally saving the records in the company registration file.

If you wish to view companies in your company file, use the 'Page Up' respectively 'Page Down' keys.

To summarize: when you chose the Registration function, you are provided with a "working copy" of the company registration file. With this working copy you may insert, change or delete company records. It is, however, not until you SAVE the registrations that the working copy is loaded into the company registration file.

### III.6. The Data Entry Function

This function allows you to enter the following types of data to an already registered company:

- Financial Balance data
- Operating Planning data
- Operating Result data
- Graph

By selecting DATA ENTRY you will get access to the following four sub-functions and help-functions:

<u>Sub-functions</u>	<u>Help-functions</u>
- Financial Balance,	- Company
- Operating Plan	- Year
- Operating Results	- Print
- Graph	- Quit

As DATA ENTRY assumes that you will enter operations data for a specific year to an already registered company, you are first requested to enter the actual year (help-function Year), regardless of which of the three sub-functions you are choosing. You are then requested to select the actual company, either by using the ENTER ID# or LIST function. On the screen will now appear the selected working document, complete with company name and identification number, ready to receive input data.

As you key in data, you will observe that data is not coming into that desired field immediately but is placed at the top of the form. When you press Return, after having made sure that you typed the correct number, ISICS will put the data item where it belongs. When all data has been entered, press F10 to return to the sub-menu and select SAVE to save the record you just created. After data has been saved, you will return to the sub-menu to select another company or another year or another sub-function. You may also leave to the main-menu by using the QUIT function.

If you wish to print the just completed working document (a "hard-copy"), use the PRINT function.

Please note that some data fields may contain the letters ERR before you enter your data. This is not wrong but just indicates that data received by this particular field will be elaborated. The ERR-letters will disappear as soon as data is entered.

Some data fields may also contain "0" which just indicates that they are summary fields which will contain sums of data as soon as you start to enter data.

Data fields which are expecting data are indicated with an "A" in the upper left corner of the screen. When you move the cursor down in your working document you will thus notice



when the "A" appears. This may be of help to find the correct line to enter data.

The sub-function GRAPH should logically belong to the Reports as it does not receive any input data. For technical reasons, however, it belongs to the Data Entry function.

### III.6.1. Financial Balance

The Financial Balance working document, shown in Appendix 1, has the following data fields:

- All Fixed Assets
- Materials in Store
- Consumerables in Store
- Total Capital (calculated from the above)
- Debts
- Total Own Capital (calculated as Total Capital-Debts)
- Bills Payable
- Spare Parts in Store
- Finished Products in Store

N.B. ISICS is not making explicit use of information about Debts and Own Capital in the reports.

All costs are given in '000 of local currency. No currency conversion is performed by ISICS.

Financial Balance data is entered once a year only and reflects balance status as per end of the last year. This data is used to calculate the Operating Indicators (see section IV.3). If this working sheet is not completed with data, one or more Operating Indicators may not be calculated.

Please note that ISICS calculates the total capital from the respective items (land etc). In case the specific sub-items are not known or data is not available, then the total should be estimated and entered to the balance.

### III.6.2. Operating Plan

The working document of the Operating Plan, shown in Appendix 1, has the following data fields:

- Sales revenue from export and domestic sales
- Cost of material, import and domestic acquisition
- Cost of equipment, import and domestic acquisition
- Cost of spare parts, import and domestic acquisition
- Energy cost
- Cost of salaries
- Total cost (calculated from the above)
- Total employment, administration and production
- Total value of production
- Total available production hours per year
- Total maintenance hours, emergency (est.) and planned
- Total convertible currency needs

Please note that export figures in USD value ('Sales revenue from export and domestic sales') are not automatically converted into export in local value but are merely included in case there is a need to indicate both USD and local values. The USD value is not included in the total revenue.

Operating planning data should be entered into the ISICS system for each period (month or year) of the actual year.

#### III.6.4. Operating Results

The working document of the Operating Results is practically identical with the working document for the Operating Plan.

It should be noted that when the total result for a year is entered rather than for the individual months, the first column (i.e. for the first period) is used for this year total.

#### III.6.5. Graph

The Graph function represents, in a bar diagram, the total sales performance for each period as actual sales revenues compared to planned sales revenues.

#### III.7. The Reports Function

If you select REPORTS from the main menu, the following sub-menu and help-menu will appear:

<u>Sub-menu</u>	<u>Help-menu</u>
- Changes in Operating Results	- Company
- Operating Results, Period and Accumulated	- Year
- Operating Indicators per Company	- Print
	- Quit

These reports do, of course, not permit any input but are merely for viewing.

Like in the Data Entry function, you must specify actual year and company before selecting the desired report.

### III.7.1. Changes in Operating Results

The report layout for Changes in Operating Results is shown in Appendix 1.

This report compares the operating results i.e. the same data as in III.6.4., between current and previous year and gives, for each report line, the changes in percent.

### III.7.2. Operating Results for Period and Accumulated

This report layout is shown in Appendix 1.

The report compares Operating Results (actual) with Operating plans, both for a specified period which ISICS requests you to indicate (e.g. month of April) and accumulated from the beginning of the year (e.g. for the period January to April). An index is used to facilitate comparison.

### III.7.3. Operating Indicators per Company

The layout for this report is shown in Appendix 1.

The 18 ISICS Operating Indicators, D1 to D18, are simple arithmetic expressions for the measuring of company performance and productivity and of resource utilization. For a more detailed description of Operating Indicators, see section IV.3.

Operating Indicators are given for the last three years, provided that data needed for the calculation has been entered into the ISICS system through the Financial Balance, Operating Plans and Operating Results.

### III.8. The OPI Grouping Function

The layout for this report is shown in Appendix 1.

This report allows the user to group companies together according to a specified search-pattern. ISICS will use the codes for company registration (see IV.2. Code List for Companies) to combine the desired search pattern. The user also has the option to specify an Operating Indicator which will be calculated for the selected companies. For example: to compare production time utilization (Operating Indicator D10) for all textile companies in a specified region with employment more than 200.

#### IV. ISICS FUNCTIONS DESCRIPTION

In this section, three ISICS functions are described, viz.

- the inflation factor
- the company codes
- the operating indicators.

##### IV.1. The Inflation Factor

Some Operating Indicators (OPIs) compare year end with year start data. If there is inflation that can not be neglected and would significantly influence the result as ISICS calculates the operating indicator, the result will be compensated for by an inflation factor. The inflation factor is taken as the average value for inflation during the year and calculated according to the following formula

$$\text{Inflation Factor} = 1 + p/2 * 100$$

where p is the total inflation for the year. ISICS will automatically insert the Inflation Factor to those OPIs where it is applied. If no Inflation Factor is specified, i.e. p is set to 0, then ISICS will not provide any inflation compensation.

##### IV.2. Code List for Company Registration

The code-list provides the codes to be used at the registration of a company. Please note that the codes may be changed in this codelist to suit the requirements of the user's organization.

Note: ISICS will create a 5-digit identification number for each registered company to be used for all transactions. The number is created from the following codes:

- Organizational Belonging (1 digit)
- Sector Code (1 digit)
- Serial Number (3 digits)

The following is an example of Code List. If this list is used or an alternative Code List has been defined to suit the actual organization, the proper code should be selected and entered when a company is to be registered:

1. Organizational Belonging (1 Digit)

1: Ministry of Industry  
2-9: Vacant

2. Sector (1 Digit)

1: Textile Industry	5: Sugar Industry
2: Chemical Industry	6: Food Industry
3: Engineering Industry	7-9: Vacant
4: Cement Industry	

3. Branch Code (4 Digits)

A 4-digit code that gives the international classification of industry branches ("Browse Numbers"). Please see Appendix 2. If no Branch Code is applicable, code '0000'.

4. Product Code (2 Digits)

A 2-digit code that gives the international classification of products ("Browse Numbers") within a specified branch. Give the code for the major product only. If no Product code is applicable, code '00'. See Appendix 2.

5. Type of Industry (1 Digit)

1: Public Industry	5-9: Vacant
2: Private Industry	
3: Mixed Public/Private	
4: Mixed Public/Multinational	

6. Serial Number (3 Digits)

A 3-digit number to be given by the ISICS administrator. The number should be sequentially selected, starting from 001, to new registered companies within each General Organization. Serial number '000' should be reserved for General Organizations.

7. Area Code (3 Digits)

A 3-digit number to give geographical region. Same area code as used by the telephone system.

8. Employment Size (1 Digit)

1: 1 - 100	employees	6: 501 - 600	employees
2: 101 - 200	"	7: 601 - 700	"
3: 201 - 300	"	8: 701 - 800	"
4: 301 - 400	"	9: 801 - 900	"
5: 401 - 500	"		

9. Total Performance (1 Digit)

This code is entered yearly (updating) and reflects the total performance for the last year per company. In order to enter the correct number from the list below (1,2,3..), refer to the Total Factory Performance (OPI number D1). E.g. Total Factory Performance =1,23 means that Total Performance is 123%, equal to code number 8.

0: < 50 %	5: 91 - 100 %
1: 50 - 60 %	6: 101 - 110 %
2: 61 - 70 %	7: 111 - 120 %
3: 71 - 80 %	8: 121 - 130 %
4: 81 - 90 %	9: > 130 %

IV.3. Operating Indicators

The 18 Operating Indicators (OPIs) are powerful functions of ISICS and allow the user to obtain instant and very condensed information about a company or a group of companies. OPIs are available for each company for the last three years and are shown when the function OPI PER COMPANY is called. The OPIs are automatically calculated by ISICS as soon as adequate data is available in the system. The OPIs D1 to D18 are described below.

D1. TFP - TOTAL FACTORY PERFORMANCE

Formula: (Total Sales Revenue) / (Total Production Cost)

Used to: Evaluate total profit or loss. This OPI is also used in the code-list at registration time and can therefore be used in the classification of companies.

Operating reference: Should be >1.

D2. TSP - TOTAL SALES PERFORMANCE

Formula: (Actual Total Sales Revenue) / (Planned Sales Revenue).

Used to: Evaluate sales output compared to plan. Indicates how well factories can plan revenues for a coming period or how the company's products are received by the market. If this indicator is significantly less than 1 then it indicates too optimistic sales planning or that sales was hampered by other factors. A company review is required. This OPI has a built-in inflation compensation factor.

Operating reference: Should be in the interval 1 to 1,5.

#### D3. SCF - SPARE PARTS COST PERFORMANCE

Formula: (Actual Spare Parts Cost) / (Planned Spare Parts Cost).

Used to: Evaluate the cost of spare parts compared to planned spare parts cost. A high ratio (>1) may indicate that the general condition of the production equipment is inadequate. A too low ratio (<<1) may indicate that too few spare parts have been acquired with the risk of increased machine break-downs in the next future. This OPI has a built-in inflation compensation factor.

Operating reference: Should be around 1.0

#### D4. ENP - EMPLOYMENT PERFORMANCE

Formula: (Actual Total Sales) / (Actual Total Employment).

Used to: Evaluate how many employees are actually involved to achieve the actual sales results. All employment categories should be included, i.e. production, administration, management.

Operating reference: Monitor trends with last year(s) and with other companies in the sector. Watch for over-employment, i.e. too many employees are used to reach the financial result. There may be potential for rationalizations.

## D5. PRP - PRODUCTION TO REVENUE PERFORMANCE

Formula: (Production Value End of this Year - Stores Value of Finished Products End of this Year) / (Production Value End of this Year. The formula is identical with Total Revenue End of this Year - Stores Value of Finished Products Beginning of this Year) / (Production Value End of this Year.

Used to: Evaluate how much of sales revenues of this year actually was produced this year and how much was sold from last year's production. This OPI is important as it indicates how much of produced volume is actually sold.

Operating reference: Should be close to 1.

## D6. LRP - LABOUR PRODUCTIVITY

Formula: (Total Sales Value-Total Material Cost) / (Total Salaries). NB: Total Sales Value-Total Material Cost is generally referred to as Added Value, i.e. the value that the market is prepared to pay for the work done in the factory as material undergoes a process to finished product.

Used to: Evaluate how much value of work is produced from one LS of salary. Substantial investment in automation technology will generally result in increased labour productivity.

Operating reference: No value of reference can be quoted here. Should be used in comparison with other factories and branches.

## D7. CLP - CAPITAL PRODUCTIVITY

Formula: (Total Sales Value-Total Material Cost) / (Total Capital)

Used to: Evaluate how much value of work is produced from one LS of invested LS in Total Capital. Improved materials control such as just-in-time (JIT) methods, less material in stores, quicker customer deliveries and control on customer payments will generally improve capital productivity.

Operating reference: No value of reference can be quoted here. Should be used in comparison with other factories and branches.

## D8. EQP - EQUIPMENT PRODUCTIVITY



Formula: (Total Equipment Value-Spare Parts Cost-Value of Emergency Repairs) / (Total Equipment Value)

Used to: Indicate the condition of the production equipment. In case of high spare parts cost and/or high costs for emergency repairs, the condition of the production equipment may be too low (old machinery, inadequate or insufficient maintenance) NB: the cost for emergency repairs is based on salary costs and estimated cost for lost production.

Operating reference: Should be as close to 1 as possible. Should be used in comparison with other factories and branches.

#### D9. CPU - CAPITAL UTILIZATION

Formula: (Total Sales Revenue) / (Total Value of Raw and Semifinished Material)

Used to: Evaluate how many times in a year the stock of material is turned over into sales. The general efficiency of a factory decides how quickly the cost of material (which is the same as lending money to the market) can be returned to the company in the form of sales revenue.

Operating reference: The higher this OPI is, the higher is the total efficiency of the company. The target should be 2 or above.

#### D10. PTU - PRODUCTION TIME UTILIZATION

Formula: (Total Yearly Production Hours) / (Total Available Production Hours)

Used to: Evaluate how well the available production time is utilized. Too low figure (<<1) may indicate severe production problems or interrupts in material supply.

Operating reference: This OPI should be as close to 1 as possible and definitely not less than 0.8. Should be used in comparison with other factories and branches.

## D11. CCU - CONVERTIBLE CURRENCY UTILIZATION

Formula: (Total Cost for Import) / (Planned Need of Convertible Currency)

Used to: Evaluate how much of convertible (or "hard") currency needs, planned at the beginning of the year for the import of material, spare parts etc. has actually been used for import of material, equipment and spare parts.

Operating reference: This OPI should be close to 1. A too small figure may indicate that not enough spare parts were imported or that not enough convertible currency was allocated from the financial system with the possible result of material shortages or lack of spare parts.

## D12. LCU - LOCAL CONTENT UTILIZATION

Formula: (Local Material used in Production) / (Total Material used in Production)

Used to: Evaluate how much in value of the finished products that is built upon material acquired on the local market. There is generally an industry strategy to set targets for certain branches to reach a certain percentage of local content.

Operating reference: Please refer to the specific strategies that may apply for certain branches and products.

## D13. RAW - RATIO OF ADMINISTRATION WORKFORCE

Formula: (Number of Administration Workforce) / (Number of Total Workforce)

Used to: Evaluate the share of administrative workforce in the company.

Operating reference: A comparatively (with the branch or with other factories) high share of administrators may indicate over-staffed administration and/or unnecessary bureaucracy. General references are not available but the figure ought not exceed 0.25 for an ordinary production factory.

## D14. RPW - RATIO OF PRODUCTION WORKFORCE

Formula: (Number of Production Workforce) / (Number of Total Workforce)

Used to: Evaluate the share of production workforce in the company.

Operating reference: A comparatively (with the branch or with other factories) high share of production workforce may indicate a low degree of automation.

#### D15. ESR - EMERGENCY SERVICE RATIO

Formula: (Total Number of Hours for Emergency Repair) / (Total Number of Maintenance Hours)

Used to: Evaluate the share of emergency repair. Emergency repair, which is unplanned and therefore interrupts the production, is much more costly than planned repair and maintenance. A high rate of emergency repair may indicate generally unreliable production equipment. Experience shows, however, that well structured maintenance procedures with enough frequent preventive maintenance can significantly reduce the need for emergency repairs.

Operating references: Should be as small as possible.

#### D16. AVG - ADDED VALUE GRADE

Formula: (Total Sales Value - Total Material Cost) / (Total Sales Value)

Used to: Evaluate the share of value of the sales revenue that has been added to material in the production process. The figure may indicate that sales price is too low compared to cost of material

Operating references: A figure between 0.5 and 1.0 gives that cost of material is half to one/tenth of the sales revenue.

#### D17. RMG - REFINEMENT GRADE

Formula:  $(\text{Total Production Cost} - \text{Total Material Cost}) / (\text{Total Production Cost})$

Used to: Evaluate the share of own costs (i.e. except material) to total product cost. A high figure may indicate that own costs are too high compared what the market is prepared to pay.

Operating references: This indicator should be in the interval  $0 < \text{RMG} < \text{AVG}$ .

#### D18. PMN - PROFIT MARGIN

Formula:  $(\text{Total Sales Revenue} - \text{Total Production Cost}) / (\text{Total Sales Revenue})$

Used to: Evaluate the profit share of total sales revenue.

Operating references: Should be  $> 0$ .

APPENDIX 1: ISICS REPORTS AND WORKING DOCUMENTS - SAMPLES

FINANCIAL BALANCE 1992

All figures in '000 Ls

FACTORY NUMBER: 12345 FACTORY

-----  
FIXED ASSETS

-Buildings	
-Equipment	
-Land	
-Others	
-Total Value	0

BILLS PAYABLE

MATERIALS IN STORE

-Raw/Unprocessed	
-Components	
-Total Value	0

SPARE PARTS IN STORE

CONSUMERABLES IN STORE

FINISHED PRODUCTS IN STORE

TOTAL CAPITAL	0
---------------	---

DEBTS

-Long Term	
-Short Term	
-Total Debts Value	0

OWN CAPITAL	0
-------------	---

OPERATING PLAN FOR 1992

FACTORY

FACTORY #: 12345

Figures in '000 Ls

	Period:			
	1	2	3	4
<b>REVENUE</b>				
-Export (USD value)				
-Export (local currency value)				
-Domestic				
-Total Revenue Local Curr. Value	0	0	0	0
<b>COST OF MATERIAL</b>				
-Import				
-Local				
<b>COST OF EQUIPMENT:</b>				
-Import				
-Local				
<b>COST OF SPARE PARTS:</b>				
-Import				
-Local				
<b>ENERGY COST:</b>				
<b>SALARY COST:</b>				
<b>TOTAL COST</b>				
-Import	0	0	0	0
-Local	0	0	0	0
-Total Cost Value	0	0	0	0
<b>TOTAL EMPLOYMENT (average)</b>				
	0	0	0	0
-Administrative Employment				
-Production Employment				
<b>PRODUCTION VALUE (market price)</b>				
<b>TOTAL AVAILABIE PRODUCTION HOURS</b>				
<b>TOTAL ACTUAL PRODUCTION HOURS</b>				
<b>TOTAL MAINTENANCE HOURS</b>				
-Emergency Repair:				
-Planned Maintenance				
<b>CONVERTIBLE CURRENCY NEEDS</b>				

OPERATING PLAN FOR 1992

FACTORY

FACTORY #: 12345

Figures in '000 Ls

Period: | 5 6 7 8

REVENUE

-Export (USD value)				
-Export (local currency value)				
-Domestic				
-Total Revenue Local Curr. Value	0	0	0	0

COST OF MATERIAL

-Import  
-Local

COST OF EQUIPMENT:

-Import  
-Local

COST OF SPARE PARTS:

-Import  
-Local

ENERGY COST:

SALARY COST:

TOTAL COST

-Import	0	0	0	0
-Local	0	0	0	0
-Total Cost Value	0	0	0	0

TOTAL EMPLOYMENT (average)

	0	0	0	0
--	---	---	---	---

-Administrative Employment  
-Production Employment

PRODUCTION VALUE (market price)  
TOTAL AVAILABLE PRODUCTION HOURS  
TOTAL ACTUAL PRODUCTION HOURS  
TOTAL MAINTENANCE HOURS

-Emergency Repair:  
-Planned Maintenance

CONVERTIBLE CURRENCY NEEDS



OPERATING PLAN FOR 1992

FACTORY

FACTORY #: 12345

Figures in '000 Ls

Period:	9	10	11	12	TOTAL
<b>REVENUE</b>					
-Export (USD value)					0
-Export (local currency value)					0
-Domestic					0
-Total Revenue Local Curr. Value	0	0	0	0	0
<b>COST OF MATERIAL</b>					
-Import					0
-Local					0
<b>COST OF EQUIPMENT:</b>					
-Import					0
-Local					0
<b>COST OF SPARE PARTS:</b>					
-Import					0
-Local					0
<b>ENERGY COST:</b>					
<b>SALARY COST:</b>					
<b>TOTAL COST</b>					
-Import	0	0	0	0	0
-Local	0	0	0	0	0
-Total Cost Value	0	0	0	0	0
<b>TOTAL EMPLOYMENT (average)</b>					
-Administrative Employment					ERR
-Production Employment					ERR
<b>PRODUCTION VALUE (market price)</b>					
<b>TOTAL AVAILABLE PRODUCTION HOURS</b>					
<b>TOTAL ACTUAL PRODUCTION HOURS</b>					
<b>TOTAL MAINTENANCE HOURS</b>					
<b>-Emergency Repair:</b>					
<b>-Planned Maintenance</b>					
<b>CONVERTIBLE CURRENCY NEEDS</b>					

OPERATING RESULTS FOR YEAR 1992 : PERIOD 4 AND ACCUMULATED  
 FACTORY

FACTORY #: 12345

Figures in '000 Ls

	Period 4		Accumulated	
	Actual	Plan	Actual	Plan
REVENUE				
-Export (USD value)				
-Export (local currency value)				
-Domestic				
-Total Revenue Local Curr. Va				
COST OF MATERIAL				
-Import				
-Local				
COST OF EQUIPMENT:				
-Import				
-Local				
COST OF SPARE PARTS:				
-Import				
-Local				
ENERGY COST:				
SALARY COST:				
TOTAL COST				
-Import				
-Local				
-Total Cost Value				
TOTAL EMPLOYMENT (average)				
-Administrative Employment				
-Production Employment				
PRODUCTION VALUE (market price)				
TOTAL AVAILABLE PRODUCTION HOURS				
TOTAL ACTUAL PRODUCTION HOURS				
TOTAL MAINTENANCE HOURS				
-Emergency Repair:				
-Planned Maintenance				
ALLOCATED CONVERTIBLE CURRENCY				

OPERATING RESULTS FOR 1992

FACTORY

FACTORY #: 12345

Figures in '000 Ls

	Period:	1	2	3	4
<b>REVENUE</b>					
-Export (USD value)					
-Export (local currency value)					
-Domestic					
-Total Revenue Local Curr. Value		0	0	0	0
<b>COST OF MATERIAL</b>					
-Import					
-Local					
<b>COST OF EQUIPMENT:</b>					
-Import					
-Local					
<b>COST OF SPARE PARTS:</b>					
-Import					
-Local					
<b>ENERGY COST:</b>					
<b>SALARY COST:</b>					
<b>TOTAL COST</b>					
-Import		0	0	0	0
-Local		0	0	0	0
-Total Cost Value		0	0	0	0
<b>TOTAL EMPLOYMENT (average)</b>					
		0	0	0	0
-Administrative Employment					
-Production Employment					
<b>PRODUCTION VALUE (market price)</b>					
<b>TOTAL AVAILABLE PRODUCTION HOURS</b>					
<b>TOTAL ACTUAL PRODUCTION HOURS</b>					
<b>TOTAL MAINTENANCE HOURS</b>					
-Emergency Repair:					
-Planned Maintenance					
<b>ALLOCATED CONVERTIBLE CURRENCY</b>					

CHANGES IN OPERATING RESULTS

FACTORY

FACTORY #: 12345

Figures in '000 Ls

	1992	1991	CHANGE
<hr/>			
REVENUE			
-Export (USD value)			
-Export (local currency value)			
-Domestic			
-Total Revenue Local Curr. Value			
COST OF MATERIAL			
-Import			
-Local			
COST OF EQUIPMENT:			
-Import			
-Local			
COST OF SPARE PARTS:			
-Import			
-Local			
ENERGY COST:			
SALARY COST:			
TOTAL COST			
-Import			
-Local			
-Total Cost Value			
TOTAL EMPLOYMENT (average)			
-Administrative Employment			
-Production Employment			
PRODUCTION VALUE (market price)			
TOTAL AVAILABLE PRODUCTION HOURS			
TOTAL ACTUAL PRODUCTION HOURS			
TOTAL MAINTENANCE HOURS			
-Emergency Repair:			
-Planned Maintenance			
ALLOCATED CONVERTIBLE CURRENCY			

OPERATING INDICATORS (OPI)

FACTORY

FACTORY # :12345

1992

1991

1990

-----  
Performace

- D1. TOTAL FACTORY PERFORMANCE - TFP
- D2. TOTAL SALES PERFORMANCE - TSP
- D3. SPARE PARTS COST PERFORMANCE - SCP
- D4. EMPLOYMENT PERFORMANCE - ENP
- D5. PRODUCTION TO REVENUE PERFORMANCE - PRP

-----  
Productivity

- D6. LABOUR PRODUCTIVITY - LRP
- D7. CAPITAL PRODUCTIVITY - CLP
- D8. EQUIPMENT PRODUCTIVITY - EQP

-----  
Utilization

- D9. CAPITAL UTILIZATION - CPU
- D10. PRODUCTION TIME UTILIZATION - PTU
- D11. CONVERTIBLE CURRENCY UTILIZATION - CCU
- D12. LOCAL CONTENT UTILIZATION - LCU

-----  
Share-of-Total

- D13. RATIO OF ADMINISTRATION WORKFORCE - RAW
- D14. RATIO OF PRODUCTION WORKFORCE - RPW
- D15. EMERGENCY SERVICE RATIO - ESR
- D16. ADDED VALUE GRADE - AVG
- D17. REFINEMENT GRADE - RMG
- D18. PROFIT MARGIN - PMN

PRODUCTION TO REVENUE PERFORMANCE - PRP

-----  
ORGANIZATIONAL BELONGING:

SECTOR CODE:

BRANCH CODE:

PRODUCT CODE:

TYPE OF ORGANIZATION:

AREA CODE:

EMPLOYMENT SIZE:

ACHIEVMENT:

-----  
ID NUMBER COMPANY NAME

|

1992

1991

1990  
-----

## APPENDIX 2: BRANCH AND PRODUCT CODES.

In the Company Code List, used for the classification of companies as they are registered in the ISICS company file, two of the codes are Branch Code and Product Code respectively. The use of these codes are motivated for two reasons:

1. In the function OPI Grouping Report it may be of interest to group companies together from the same branch
2. In comparison with international statistics the use of an international branch- and product code will facilitate that ISICS data can serve as basis for national industry statistics.

The codes to be used are

for the Branch Code:

the International Standard Industrial Classification of All Economic Activities (ISIC), 1990 revision.

The complete list is available as UNSO Statistical Papers, Series M, No.4, Rev.3 (1990)

for the Product Code:

the Central Product Classification (CPC).

The complete list is available as UNSO Statistical Papers, Series M, No.77 (1991).

A sample of the codes, also known as Browse Records, are attached to this Appendix.

BROWSE RECORDS  
3-DIGIT MAJOR GROUPS

ISIC3DIG	INDUSTRY
311	3 FOOD MANUFACTURING
312	3 OTHER FOOD MANUFACTURING
313	3 BEVERAGE INDUSTRIES
314	3 TOBACCO MANUFACTURES
321	3 MANUFACTURE OF TEXTILES
322	3 MANUFACTURE OF CLOTHES EXCEPT FOOTWEAR
323	3 LEATHER PRODUCTS EXCL. FOOTWEAR & CLOTHES
324	3 FOOTWEAR EXCL. RUBBER OR PLASTIC FOOTWEAR
331	3 WOOD AND CORK PRODUCTS EXCL. FURNITURE
332	3 FURNITURE & FIXTURES EXCL. METAL
341	3 MANUFACTURE OF PAPER AND PAPER PRODUCTS
342	3 PRINTING, PUBLISHING & ALLIED INDUSTRIES
351	3 MANUFACTURE OF INDUSTRIAL CHEMICALS
352	3 MANUFACTURE OF OTHER CHEMICAL PRODUCTS
353	3 PETROLEUM REFINERIES
354	3 MANUF. OF PETROLEUM AND COAL PRODUCTS
355	3 MANUFACTURE OF RUBBER PRODUCTS

Records selected: 30  
PRESS <PF1> KEY FOR HELP

BROWSE RECORDS  
3-DIGIT MAJOR GROUPS

ISIC3DIG	INDUSTRY
352	3 MANUFACTURE OF OTHER CHEMICAL PRODUCTS
353	3 PETROLEUM REFINERIES
354	3 MANUF. OF PETROLEUM AND COAL PRODUCTS
355	3 MANUFACTURE OF RUBBER PRODUCTS
356	3 MANUFACTURE OF OTHER PLASTIC PRODUCTS
361	3 MANUF. OF POTTERY, CHINA & EARTHENWARE
362	3 MANUF. OF GLASS AND GLASS PRODUCTS
369	3 NON-METALLIC MINERAL PRODUCTS nec.
371	3 IRON AND STEEL BASIC INDUSTRIES
372	3 NON-FERROUS METAL BASIC INDUSTRIES
381	3 METAL PRODS. EXCL. MACHINERY AND EQUIPMT
382	3 MANUF. OF MACHINERY EXCL. ELECTRICAL
383	3 ELECTRICAL MACHINERY, APPLIANCES, SUPPLIES
384	3 MANUFACTURE OF TRANSPORT EQUIPMENT
385	3 MANUFACTURE OF PROFESSIONAL GOODS
390	3 OTHER INDUSTRIES
300	3 TOTAL MANUFACTURING

Records selected: 30  
PRESS <PF1> KEY FOR HELP



BROWSE RECORDS  
BRANCHES

```
IND_CODE  INDUSTRY
3111      J SLAUGHTERING, PREPARING, & PRESERVING MEAT
3112      J MANUFACTURE OF DAIRY PRODUCTS
3113      J CANNING AND PRESERVING OF FRUITS AND VEG
3114      J CANNING, PRESERVING, PROCESSING OF SEAFOOD
3115      J MANUFACTURE OF VEGETABLE AND ANIMAL FATS
3116      J GRAIN MILL PRODUCTS
3117      J MANUFACTURE OF BAKERY PRODUCTS
3118      J SUGAR FACTORIES AND REFINERIES
3119      J MANUFACTURE OF CHOCOLATE, CONFECTIONARY
3121      J FOOD PRODUCTS NOT ELSEWHERE CLASSIFIED
3122      J MANUFACTURE OF PREPARED ANIMAL FEEDS
3131      J DISTILLING AND BLENDING SPIRITS
3132      J WINE INDUSTRIES
3133      J MALT LIQUORS AND MALT
3134      J SOFT DRINKS & CARBONATED WATERS INDUST.
3140      J TOBACCO MANUFACTURES
3211      J SPINNING, WEAVING AND FINISHING TEXTILES
```

Records selected: 81  
PRESS <PF1> KEY FOR HELP

BROWSE RECORDS  
BRANCHES

```
IND_CODE  INDUSTRY
3212      J MANUFACTURE OF MADE-UP TEXTILE GOODS
3213      J KNITTING MILLS
3214      J MANUFACTURE OF CARPETS AND RUGS
3215      J CORDAGE, ROPE AND TWINE INDUSTRIES
3219      J TEXTILES NOT ELSEWHERE CLASSIFIED
3220      J MANUFACTURE -ALL CLOTHES EXCEPT FOOTWEAR
3231      J TANNERIES AND LEATHER FINISHING
3232      J FUR DRESSING AND DYEING INDUSTRIES
3233      J LEATHER AND SUBSTITUTES EXCEPT FOOTWEAR
3240      J FOOTWEAR, EXCEPT VULCANIZED & RUBBER ETC.
3311      J SAWMILLS, PLANING AND OTHER WOOD MILLS
3312      J WOODEN+CANE CONTAINERS & SMALL CANEWARE
3319      J WOOD & CORK PRODUCTS
3320      J FURNITURE AND FIXTURES
3411      J MANUFACTURE OF PULP, PAPER AND PAPERBOARD
3412      J CONTAINERS & BOXES OF PAPER & PAPERBOARD
3419      J PULP, PAPER & PAPERBOARD ARTICLES
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Records selected: 81  
PRESS <PF1> KEY FOR HELP

BROWSE RECORDS

BRANCHES

IND_CODE	INDUSTRY
3420	3 PRINTING, PUBLISHING & ALLIED INDUSTRIES
3511	3 BASIC INDUST. CHEMICALS EXC. FERTILIZERS
3512	3 MANUFACTURE OF FERTILIZERS & PESTICIDES
3513	3 SYNTHETIC RESINS, EXCEPT GLASS
3521	3 PAINTS, VARNISHES AND LACQUERS
3522	3 MANUFACTURE OF DRUGS AND MEDICINES
3523	3 SOAP, CLEANING PREPARATIONS & PERFUME ETC
3529	3 CHEMICAL PRODS. NOT ELSEWHERE CLASSIFIED
3530	3 PETROLEUM REFINERIES
3540	3 MISCELLANEOUS PRODS. OF PETROLEUM & COAL
3551	3 TYRE AND TUBE INDUSTRIES
3559	3 RUBBER PRODUCTS NOT ELSEWHERE CLASSIFIED
3560	3 PLASTIC PRODS. NOT ELSEWHERE CLASSIFIED
3610	3 POTTERY, CHINA AND EARTHENWARE
3620	3 MANUFACTURE OF GLASS AND GLASS PRODUCTS
3691	3 STRUCTURAL CLAY PRODUCTS
3692	3 MANUFACTURE OF CEMENT, LIME AND PLASTER

Records selected: 81  
PRESS <PF1> KEY FOR HELP

BROWSE RECORDS

BRANCHES

IND_CODE	INDUSTRY
3610	3 POTTERY, CHINA AND EARTHENWARE
3620	3 MANUFACTURE OF GLASS AND GLASS PRODUCTS
3691	3 STRUCTURAL CLAY PRODUCTS
3692	3 MANUFACTURE OF CEMENT, LIME AND PLASTER
3699	3 NON-METALLIC MINERAL PRODUCTS N.E.C
3710	3 IRON AND STEEL BASIC INDUSTRIES
3720	3 NON-FERROUS METAL BASIC INDUSTRIES
3811	3 CUTLERY, HAND TOOLS AND GENERAL HARDWARE
3812	3 FURNITURE & FIXTURES PRIMARILY OF METAL
3813	3 STRUCTURAL METAL PRODUCTS
3819	3 METAL PRODS. EXC. MACHINERY & EQUIPMENT
3821	3 MANUFACTURE OF ENGINES AND TURBINES
3822	3 AGRICULTURAL MACHINERY AND EQUIPMENT
3823	3 METAL AND WOOD WORKING MACHINERY
3824	3 IND. MACHINERY EXCL. METAL & WOODWORKING
3825	3 OFFICE, COMPUTING & ACCOUNTING MACHINERY
3829	3 MACHINERY & EQUIP. EXC. ELECTRICAL N.E.C

Records selected: 81  
PRESS <PF1> KEY FOR HELP

BROWSE RECORDS  
BRANCHES

IND_CODE	INDUSTRY
3831	J ELECTRICAL INDUST. MACHINERY & APPARATUS
3832	J RADIO, TELEVISION & COMMUNICATION EQUIP.
3833	J ELECTRICAL APPLIANCES AND HOUSEWARES
3839	J ELECTRICAL APPARATUS AND SUPPLIES N.E.C
3841	J SHIP BUILDING AND REPAIRING
3842	J RAILROAD EQUIPMENT
3843	J MANUFACTURE OF MOTOR VEHICLES
3844	J MANUFACTURE OF MOTORCYCLES AND BICYCLES
3845	J MANUFACTURE OF AIRCRAFT
3849	J MANUFACTURE OF TRANSPORT EQUIPMENT N.E.C
3851	J PROFESSIONAL, SCIENTIFIC+MEASURING EQUIP.
3852	J PHOTOGRAPHIC AND OPTICAL GOODS
3853	J MANUFACTURE OF WATCHES AND CLOCKS
3901	J JEWELLERY AND RELATED ARTICLES
3902	J MANUFACTURE OF MUSICAL INSTRUMENTS
3903	J SPORTING AND ATHLETIC GOODS
3909	J INDUSTRIES NOT ELSEWHERE CLASSIFIED

Records selected: 81  
PRESS <PF1> KEY FOR HELP

BROWSE RECORDS  
PRODUCTS

ISICCODE	PRODESCR
311101	J BEEF AND VEAL, FRESH
311104	J MUTTON AND LAMB, FRESH
311107	J PORK, FRESH
311110	J POULTRY, DRESSED, FRESH
311113	J OTHER MEAT, FRESH
311116	J BACON, HAM & DRIED, SALTED, SMOKED PIG MEAT
311119	J OTHER MEAT AND EDIBLE OFFALS
311122	J SAUSAGES
311125	J MEATS, FROZEN PREPARED
311128	J MEAT, CANNED
311131	J LARD
311134	J HIDES, CATTLE AND HORSE, UNDRESSED
311137	J SKINS, CALF, GOAT AND SHEEP, UNDRESSED
311201	J MILK AND CREAM, CONDENSED
311204	J MILK AND CREAM, DRIED
311207	J BUTTER
311210	J CHEESE

Records selected: 463  
PRESS <PF1> KEY FOR HELP

BROWSE RECORDS  
PRODUCTS

ISICCODE	PRODESCR
371040	J HEAVY PLATES, OVER 4.75 MM
371043	J MEDIUM PLATES, 3 TO 4.75 MM
371046	J SHEETS ELECTRICAL
371049	J SHEETS UNDER 3 MM, COLD-ROLLED, UNCOATED
371052	J SHEETS UNDER 3 MM, HOT-ROLLED
371055	J TINPLATE
371058	J GALVANIZED SHEETS
371061	J HOOP AND STRIP, COLD-REDUCED
371064	J HOOP AND STRIP, HOT-ROLLED
371067	J RAILWAY TRACK MATERIAL
371070	J WIRE, PLAIN
371076	J TUBES, SEAMLESS
371079	J TUBES, WELDED
371085	J STEEL CASTINGS IN THE ROUGH STATE
371088	J STEEL FORGINGS
371091	J WHEELS, WHEEL CENTRES, TIRES AND AXLES
372001	J COPPER, BLISTER AND OTHER UNREFINED

Records selected: 463  
PRESS <PF1> KEY FOR HELP

BROWSE RECORDS  
PRODUCTS

ISICCODE	PRODDESCR
355907	3 RUBBER, UNHARDENED VULCANIZED PIPING, ETC.
355910	3 RUBBER, HARDENED (EBONITE IN BLOCKS ETC.)
355913	3 RUBBER, TRANSMISSION, CONVEYOR ETC.
355916	3 RUBBER FOOTWEAR
361001	3 HOUSEHOLD WARE OF PORCELAIN OR CHINA
361004	3 HOUSEHOLD WARE OF OTHER CERAMIC MATERIAL
361007	3 SANITARY CERAMIC FITTINGS (E.G. SINKS) ETC.
362001	3 GLASS, DRAWN OR BLOWN, IN RECTANGLES
362004	3 GLASS, CAST, ROLLED, DRAWN OR BLOWN
362007	3 TOUGHENED OR LAMINATED SAFETY GLASS
362010	3 GLASS BOTTLES ETC.
369101	3 BUILDING BRICKS, MADE OF CLAY
369104	3 TILES, ROOFING, MADE OF CLAY
369107	3 TILES, FLOOR AND WALL
369201	3 QUICKLIME
369204	3 CEMENT
369901	3 ASBESTOS-CEMENT ARTICLES

Records selected: 463  
PRESS <PF1> KEY FOR HELP