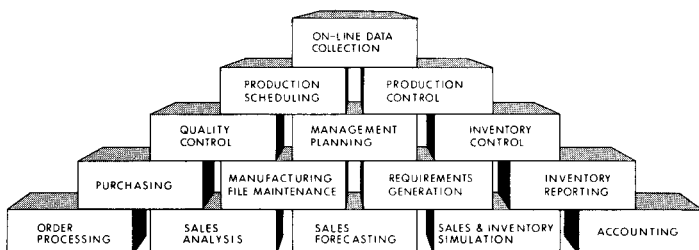


# SERIES 200

## FACTOR

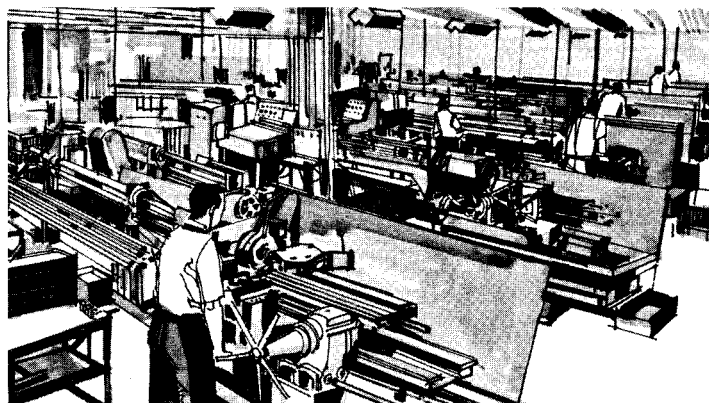
Honeywell's "Phased" Approach to an Integrated Factory Management System



Experience has shown that the company with a well planned, integrated system obtains the greatest returns from its investment in electronic data processing. Factor is such a system; conceived as a single, total entity to control an entire organization — rather than a piecemeal development of many more or less independent applications. Individual applications are designed to meet the specialized needs of limited areas, but with the needs of the whole organization in mind. This results in a system, welded together by data flows, in which all parts are integrated into the whole. Redundancy in data storage and the transmission of useless information from one area of the organization to another are eliminated.

Factor includes the following subsystems.

- Sales Forecasting
- Order Processing
- Inventory Reporting
- Accounting
- Purchasing
- Inventory Control
- Manufacturing File Maintenance
- Requirements Generation
- Management Planning
- Production Scheduling
- Production Control



Factor is based on the experience gained in establishing and operating systems within Honeywell's own manufacturing divisions and in helping numerous customers install their systems. This experience is now combined with flexible and powerful Series 200 hardware to produce a third-generation integrated system for manufacturers.

### THE SYSTEM

The accompanying diagram illustrates the Factor system. The outer area represents the "Outside World." In this area are shown products, materials, data, and cash which interact with the total Factor system. For example, orders are received from customers. This triggers off activity in many areas of the Factor system. Inventory is checked and, if available, products are shipped with accompanying invoices. Cash is received and checked against the original invoice data. Purchase requisitions are sent to vendors; this action results in the receipt of materials and parts into manufacturing inventory and in the receipt of invoices which in turn call for cash payments. All this activity is summarized into sales statistics, manufacturing reports, and financial records. These, together with economic, financial, and market data from the outside world, enable management to plan ahead.

HONEYWELL EDP AND THE MANUFACTURING INDUSTRIES — As a manufacturer producing a diverse line of products and processes, Honeywell is well qualified to support its computer customers in the manufacturing industries with advanced systems capabilities. FACTOR is the vehicle by which Honeywell brings its manufacturing "know how" to its customers. Other publications will cover detailed subsystems and techniques which make up FACTOR.

The inner area of the diagram — the “Systems Area” — includes the principal Factor subsystems and the main reports and data elements moving within the overall system. As can be seen, this area is divided into four main functions: sales, production, management planning, and accounting. Within these divisions, the subsystems embrace all functions of the manufacturing operation.

Factor should not be regarded as a purely computer system, but as an interrelated man-machine system. For example, in the forecasting area a proportion of the items are computer forecasted while other items are better covered by human effort. Inventory control parameters are calculated by the computer — subject to the overriding judgment of management. In the purchasing subsystem, the knowledge of a skilled buyer can modify the computer’s choice of batch size or vendor.

The center area of the diagram illustrates the concept of a central “Data Base.” This Data Base comprises a group of three major files and many secondary files. Generally an item of information will only exist in one file where it may be utilized by any or all subsystems. This is in contrast to a manual system where the same item of information may exist in many files in several locations.

## IMPLEMENTATION PLAN — THE PHASED APPROACH

Factor is designed to be implemented in four main phases. Thus, the total system will come into existence gradually; the period of time being adjusted to the resources and EDP experience of each company. The implementation plan envisions subsystem development within the following phases:

### Phase 1

- Sales Forecasting
- Order Processing
- Inventory Reporting
- Accounting

### Phase 2

- Purchasing
- Inventory Control
- Manufacturing File Maintenance
- Requirements Generation

### Phase 3

- Management Planning
- Production Scheduling
- Production Control

### Phase 4

- On-Line Data Collection

Series 200 configurations can be designed to match the user’s needs for each phase in his progression towards the integrated system. Generally speaking, Phase 1 subsystems are oriented towards sequential processing, Phases 2 and 3 require the facilities of mixed sequential and random devices, and Phase 4 includes communications capability.

## THE DATA BASE

The central Data Base of Factor includes three main files and several secondary files. The three main files are:

1. **Inventory:** This file includes data concerning stock-on-hand, future commitments, planned production, cost, safety stock, economic order quantity, and other elements pertinent to the inventory file.
2. **Manufacturing:** This file contains data on how to make each part — in terms of the sub-assemblies, piece parts, and raw materials; it also contains data on the assembly or fabrication operations. The bill

of materials data for each assembly is in terms of a one-level bill. Each subassembly is then further broken down elsewhere in the file. This action proceeds down to the raw material or purchased part level. Route-sheet data, standard cost, and lead times are also held in this file.

3. **Work-in-Progress and Work Center Capacity:** This file contains details concerning each production batch released for manufacturing. The data includes machine or assembly centers, planned and actual times (the latter for completed operations), planned and actual quantities produced, and labor or skill codes. In addition, planned available machine or assembly center capacities by week are held in this file.

Among the secondary information files forming the Data Base are: customer details, sales statistics, vendor and purchasing, quality control, payables, receivables, department budget, and maintenance files.

In summary, the Data Base contains all data required to plan and control the operations of a manufacturing company. By storing data centrally — accessible to all subsystems — duplication of data elements among many files is eliminated.

## THE SUBSYSTEMS

### Sales Forecasting

This subsystem handles the forecasting of sales using manual and automatic (exponential smoothing) forecasting techniques. In addition, essential parameters for inventory control are calculated based on the level of customer service required by management (as well as on other factors).

### Order Processing

This subsystem deals with customer orders from preliminary logging, technical verification, and credit checking through to entry into the Data Base and reporting of possible delivery dates. When the order becomes due and stock is shipped, the Order Processing subsystem issues an invoice to the customer.

### Inventory Reporting

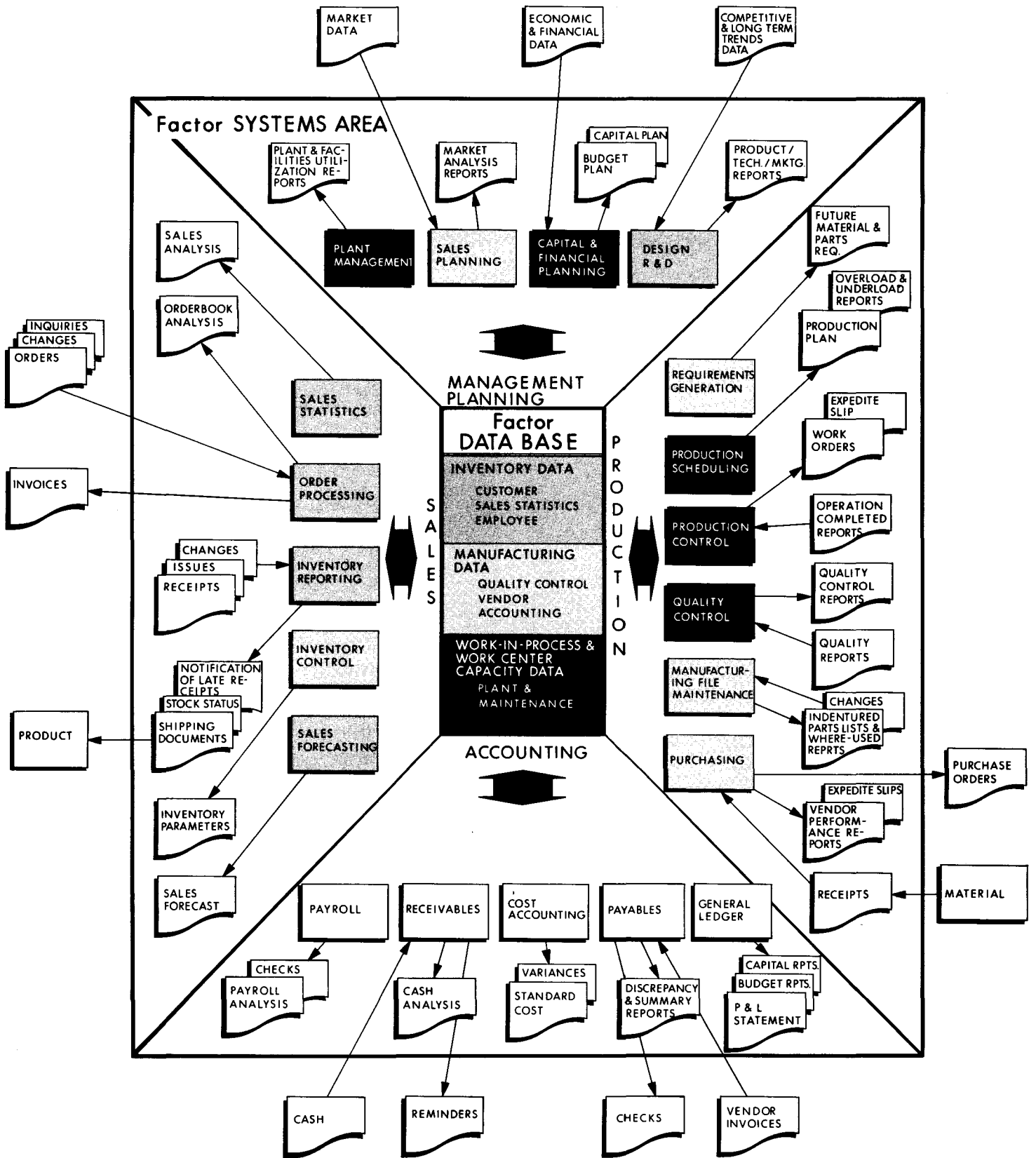
This subsystem handles the day-to-day transactions — issues, receipts, etc. — from the stockroom. It issues shipping documents to fill orders as stock is available and delivery is due. It also checks on planned production, issues replenishment requests to production planning, and notifies of imminent stock-outs and surpluses. The subsystem covers both finished goods and manufacturing inventories.

### Accounting

Within this subsystem are procedures for handling receivables and payables, maintaining ledgers, calculating standard costs, and producing the payroll for the company. In addition, various cost reports relating to the production operation, inventory, and operating expense are produced from data received by other subsystems. Standard cost reports giving variances are produced as by-products of production control data. Main management reports, such as the profit and loss and capital assets statements, are maintained.

### Purchasing

This subsystem handles the buying of material and purchased parts required to satisfy the manufacturing program. It maintains vendor history files from which buyers can obtain valuable data.



## **Inventory Control**

Once basic inventory data has been established by the forecasting and inventory reporting subsystems, all the functions of inventory control (including automatic replenishment procedures, an EOQ, and safety stock calculations) can be implemented.

## **Manufacturing File Maintenance**

This subsystem handles the creation and maintenance of the data files describing the manufacturing processes for each product made by the company. Included are the bill of materials, route sheet, standard cost, and lead time data. In addition, valuable reports may be produced on request for Production Engineering. These reports include indented parts lists and "where-used" lists.

## **Requirements Generation**

From an input consisting of finished goods and spare parts requirements, this subsystem carries out an explosion and netting process to generate net requirements of subassemblies at all levels, piece parts, raw materials, and purchased parts by time period. Output from the system is a production program expressed in quantities of piece parts, subassemblies, and final products to be made in each time period.

## **Management Planning**

Within this subsystem are a number of programs for producing overall management information on the basis of data accumulated in the Data Base. Among the reports which may be produced are factory utilization, forecast factory load reports, budgetary status data, cash, and capital assets reports. External economic and market data enters the Data Base where various techniques (e. g., linear programming and simulation) are available to manipulate this data and produce meaningful planning data for management.

## **Production Scheduling**

This subsystem produces a shop production plan, listing the batches to be produced and indicating overload or underload conditions. On the basis of this plan, management is able to determine whether or not to subcontract work or use overtime at peak periods and whether or not to take in additional jobs to fill slack periods.

## **Production Control**

The following are handled by this subsystem: issuing of shop work orders for production batches due to go into the shop, provision of authorization to withdraw material from stock for production, monitoring of work orders into the shops, and reporting of production arrears. The subsystem also collects data concerning actual time worked and material used on a job. This latter data is the basis of the variance from standard reports, the direct labor cost reports, and the direct labor payroll.

## **ON-LINE DATA COLLECTION**

In many situations, an efficient production control system can operate without recourse to an automatic data collection system. However, the delays in getting information concerning what is happening in the warehouse and on the production floor to and from the computer may make it desirable to incorporate on-line data collection and inquiry stations. However, it is emphasized that full and efficient use of on-line data collection (planned as a Phase 4 activity) demands a considerable degree of sophistication in automated procedures, the establishment of sound systems design, and the availability of accurate product, machine, and process data — in computer-accessible form.

Honeywell has a large range of communications equipment and can tie in with many of the data collection systems currently available. In addition, Honeywell markets a range of terminal devices with various capabilities including cathode-ray-tube devices.

## **FACTOR DESIGN PHILOSOPHY**

Experience in implementing application subsystems indicates that approximately 65% to 70% of the job lies in the following:

1. Determining the file design,
2. Report specification,
3. Planning appropriate controls,
4. Determining the manual procedures,
5. Determining exactly how the job is to be broken down into manageable computer runs,
6. Designing logic flow charts, and
7. Specifying transaction processing rules.

The remaining 30% to 35% of the implementation lies in actually coding the programs for the computer. Use of COBOL and Fortran can substantially reduce the difficulty of, and the time required for, this phase.

The applications packages supplied by Honeywell are aimed at easing the 65% to 70% portion of the implementation task.

In general, these are systems building blocks which can be hand-tailored to individual company needs. Program building blocks — which comprise the other 30% to 35% — are supplied where the nature of the job is such that detailed coding is practical and useful. Where such coding is supplied, it is accomplished on a modular basis so that all or part of the program package can be combined with other subsystems.

Factor subsystems cover manageable implementation units so that a company can grow by planned steps towards an integrated system.

## **SPECIAL FEATURES**

All of Factor's application packages take full advantage of Honeywell's latest hardware and software developments. These developments include:

### **Operating Systems**

Dynamic operating systems, designed for modular programming and automatic program linking, ensure minimum operator intervention and maximum throughput capability.

### **COBOL**

Honeywell's advanced COBOL compilers combine logic-oriented ease of programming with a high level of documentation. A full range of COBOL compilers is available starting with a compact 8K version. Programs written in COBOL may be compiled in the operating system environment.

### **Fortran**

This compiler can be of great use in enabling engineers to use the computer for the solution of design or other problems expressible in mathematical language. Because Fortran uses mathematical type statements, engineers can be trained to use it very rapidly.

### **Communications Packages**

These packages comprise generalized programs designed to aid the user in implementing his communications systems. A complete set of software provides object code for reading and writing messages at remote terminals. Code translations as well as device and line control functions are automatically performed.