INDUSTRIAL DATA PROCESSING APPLICATIONS REPORT

Applications	Implementing a Systems Conversion
Type of Industry	Pipe Manufacture and Sales
Name of User	Calumet & Hecla Corp., Wolverine Tube Div. Allen Park, Michigan

Equipment Used	Honeywell 200 computer system
	Honeywell 120 computer system

Synopsis

In order to alleviate control problems in order processing and to combine and standardize data processing functions, the Wolverine Tube Div. undertook a systems conversion. Before conversion, each one of the three main locations of the division had a complete dp center. Two of the computers, one at Allen Park, Michigan and the other at a plant in Decatur, Ill., had only card capability; the third also had two disc drives. The third computer was at the Detroit plant. The goal was a total management information system, and when the division reached theoretical production capacity, improvements were sought. Because the systems staff was limited and because it was necessary to secure participation from all of the division's functional areas, half of the conversion operation dealt with analysis.

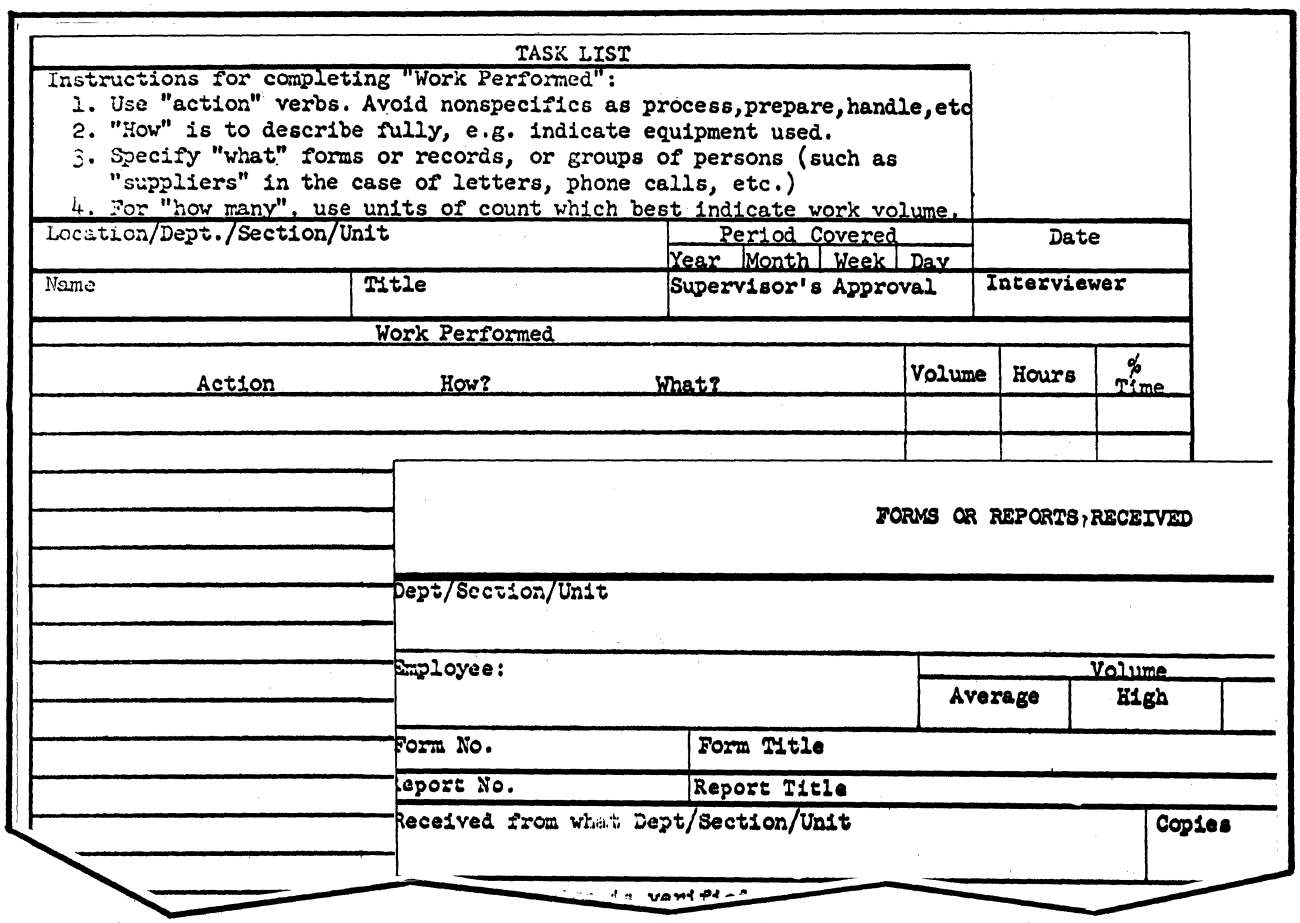
The Calumet & Hecla Corp., Division of Universal Oil Products, is an international company providing components to power nuclear generators, desalinate water, convey fluids and gases, condition air, transfer heat and assist in agriculture and forestry. Wolverine Tube Div. makes drain, vent and waste tube (DWV) used in standard plumbing installations of buildings and homes. This product is readymade and available to the customer from one of the many warehouses maintained by Calumet & Hecla, Inc., around the country. A multi-plant operation, the division has sales offices nationwide, three plants and a number of warehouses from which products are shipped to customers--other industrial facilities. All divisional control functions are exercised from divisional headquarters in Allen Park, Mich.

Data processing costs and control problems were the two areas on which the conversion project was to concentrate. Previously, orders were input into the plant from division headquarters. Acceptable orders were entered through each plant's computers into each plant's schedules. Allen Park, Decatur and Detroit each had its own programs and operating staff, under the direction of the appropriate finance officer, to whom the head of the systems and data processing function reported. The total in equipment rentals, staff and the fact that there was considerable overlap in processing the same thing in two separate locations, was understandably costly.

To begin the work leading toward a systems conversion, a presentation was made showing what management science could do to improve the situation. The presentation was accepted and conversion efforts began with a systems analysis.

An analysis team was established composed of systems department personnel and of representatives from every other company function to secure cross-company participation. A training program was organized to teach those unfamiliar with analysis techniques to assure that everyone would proceed alike. To ensure a uniform interviewing process, the formats and techniques studied in the training period were used.

The interviewing approach was from supervisor to supervised. Analysts presented themselves at the appointed hour and, after explaining their mission and methodology, asked the supervisor to list his department's duties, the people carrying out the function and the effort expended. They then proceeded to interview personnel in his department, collecting



TASK LIST

Instructions for completing "Work Performed":
1. Use "action" verbs. Avoid nonspecifics as process,prepare,handle,etc
2. "How" is to describe fully, e.g. indicate equipment used.
3. Specify "what" forms or records, or groups of persons (such as "suppliers" in the case of letters, phone calls, etc.)
4. For "how many", use units of count which best indicate work volume.

Location/Dept./Section/Unit | Period Covered: Year | Month | Week | Day | Date

Name | Title | Supervisor's Approval | Interviewer

Work Performed

Action	How?	What?	Volume	Hours	% Time

FORMS OR REPORTS RECEIVED

Dept/Section/Unit

Employee: | Volume: Average | High

Form No. | Form Title

Report No. | Report Title

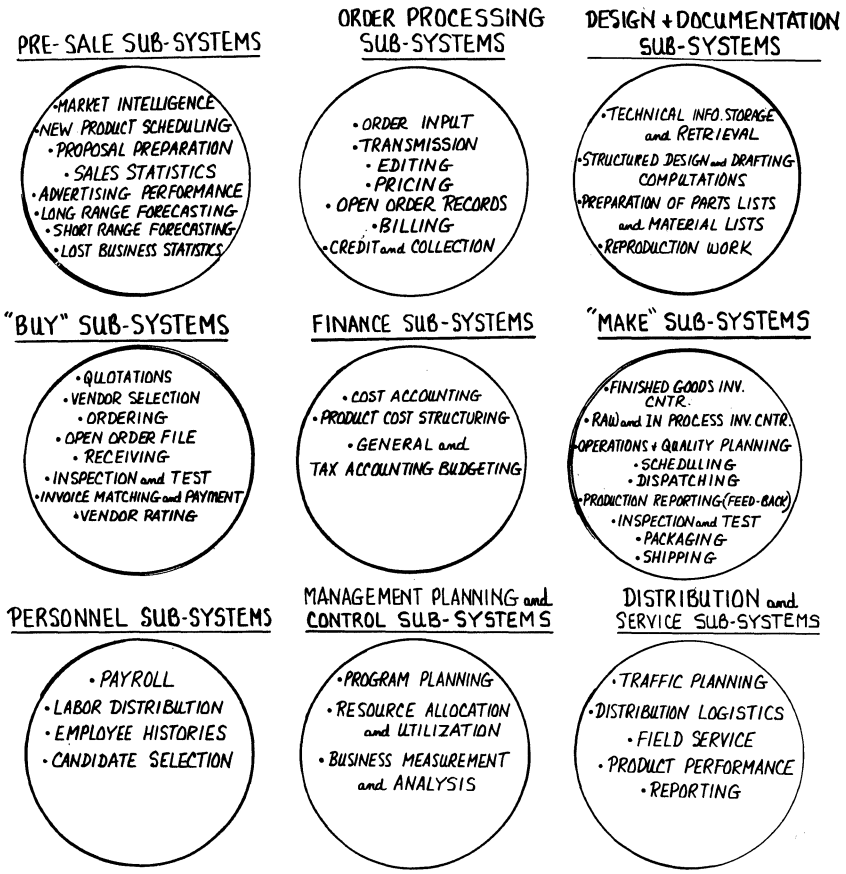
Received from what Dept/Section/Unit | Copies

DUTIES OF EACH DEPARTMENT, PERSONS CARRYING OUT FUNCTIONS AND EFFORTS EXPENDED WERE GATHERED ON TASK LISTS

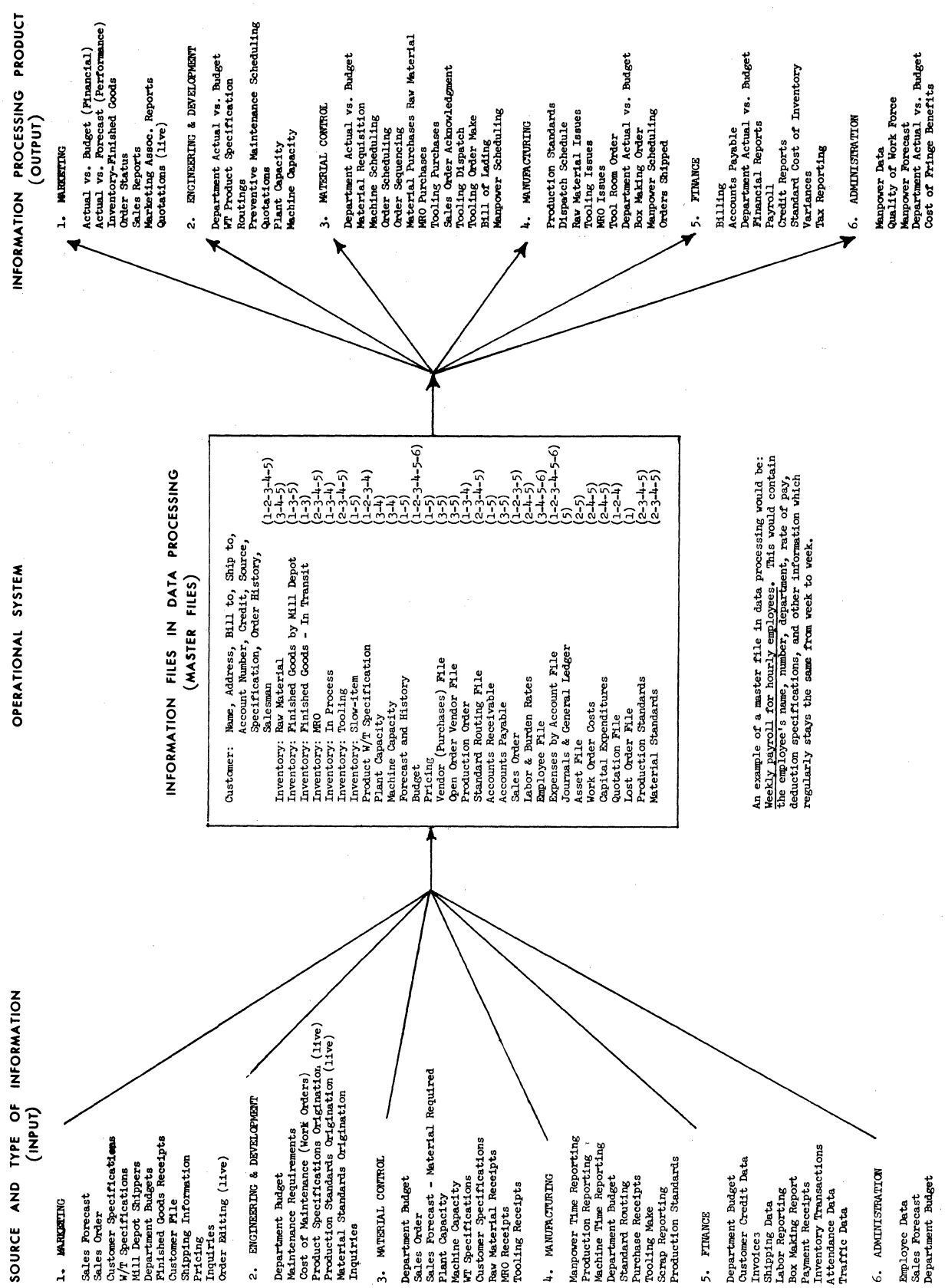
data on the forms and patterns established in the training program. Information thus gathered, with supporting forms, reports and other documents, was assimilated and displayed on flowcharts. To the extent possible, the flow of each major form or report was displayed through all its steps. The systems analysis, which preceded the conversion, not only showed costs in their true light, but also pointed out areas where delays in serving the customer -- as well as the other system inefficiencies. For example, a customer's order could take up to three working days before acknowledgment. (Now the maximum cycle time is eight hours.)

After the original try at complete analysis, two additional surveys were made in as many different divisions of Calumet & Hecla, Inc. The team's conclusion was that there is something to be said for displaying subsystems with their own subset of flowcharts. While the single flow is more impressive, the second was was felt to be more manageable.

With the systems analysis finished, several by-products were obtained. Forms and reports, for example, had grown and multiplied until a considerable amount of similar information was cast in quite a few different ways, sometimes giving answers that appeared to differ one from another, making it difficult to see a "true" picture of the operation. Both for effect, as well as for instruction purposes, these forms and reports were openly displayed. A by-product of this display was an acceptably accurate picture of forms and reports which could be streamlined. Another by-product of the analysis was an accurate work count and a thorough understanding of the manner in which the division processed its information. The systems analysis, in conclusions and the attendant proposals, made it clear that a radical change in systems was needed. Conceptually, the need was obvious. All that was required was to show this need; suggest a remedy to management, and, if acceptable, develop and implement it.



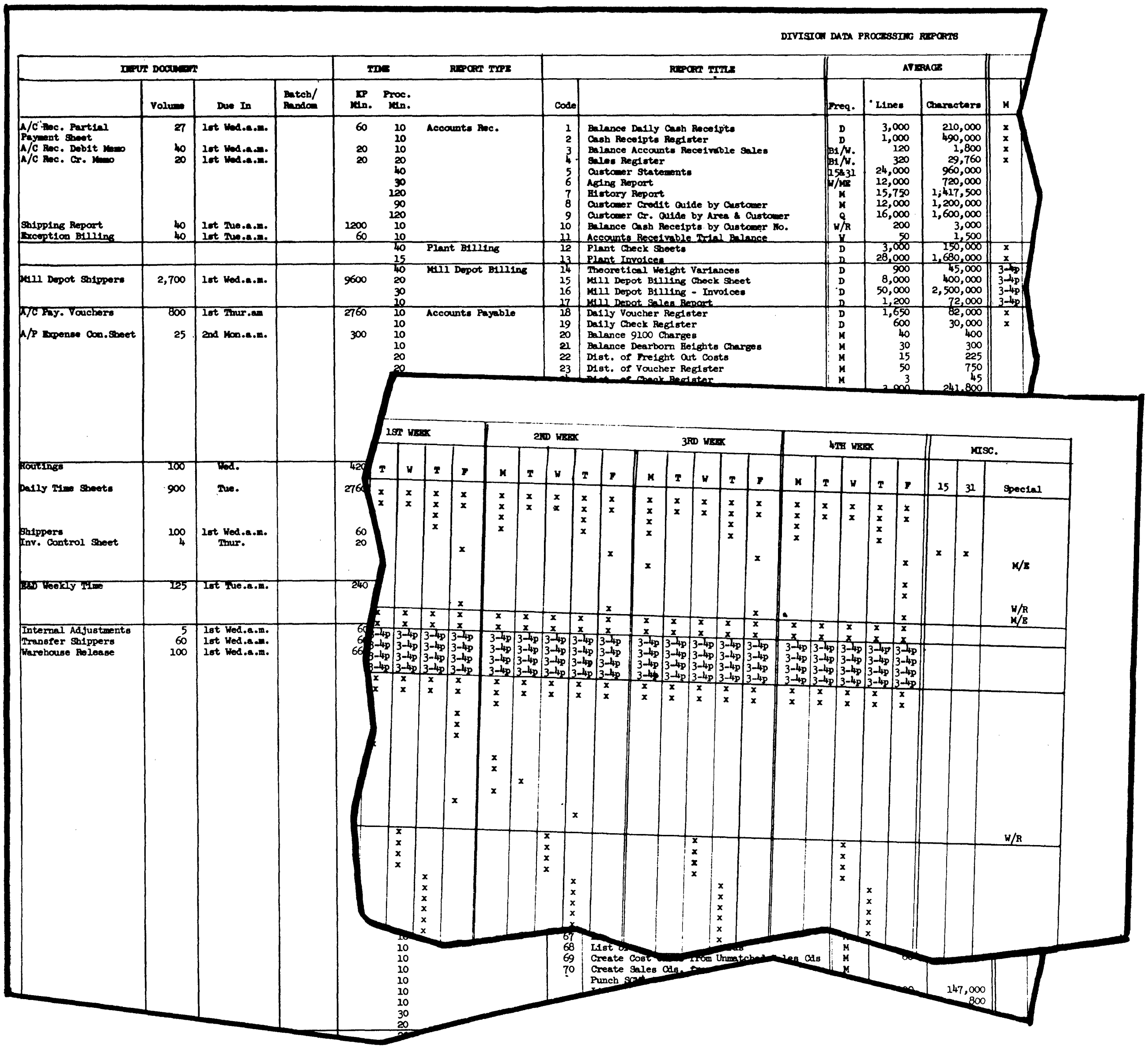
A WORK COUNT WAS ESTABLISHED BY LISTING THE VARIOUS TYPES OF SUB-SYSTEMS THAT COMPRISED THE SEPARATE FUNCTIONS OF THE FIRM. THE NINE SUB-SYSTEMS GROUPS LISTED HERE ARE FAMILIAR COMPONENTS OF A TOTAL INFORMATION PROCESSING SYSTEM.



A RECOMMENDED SYSTEM AND IMPLEMENTATION PROGRAM WAS PRESENTED

Survey findings were summarized in a 3-part proposal. The proposal described the methods used in analysis, the system as it existed and its problems, the system recommended and an implementation program. Some of the material was again conceptual. In other cases, both in text and picture, the actual, specific work process was described in terms of forms used and actions needed. In effect, new flowcharts were prepared showing how the proposed system would operate. Also included were charts for the implementation, the hardware concept and putative costs.

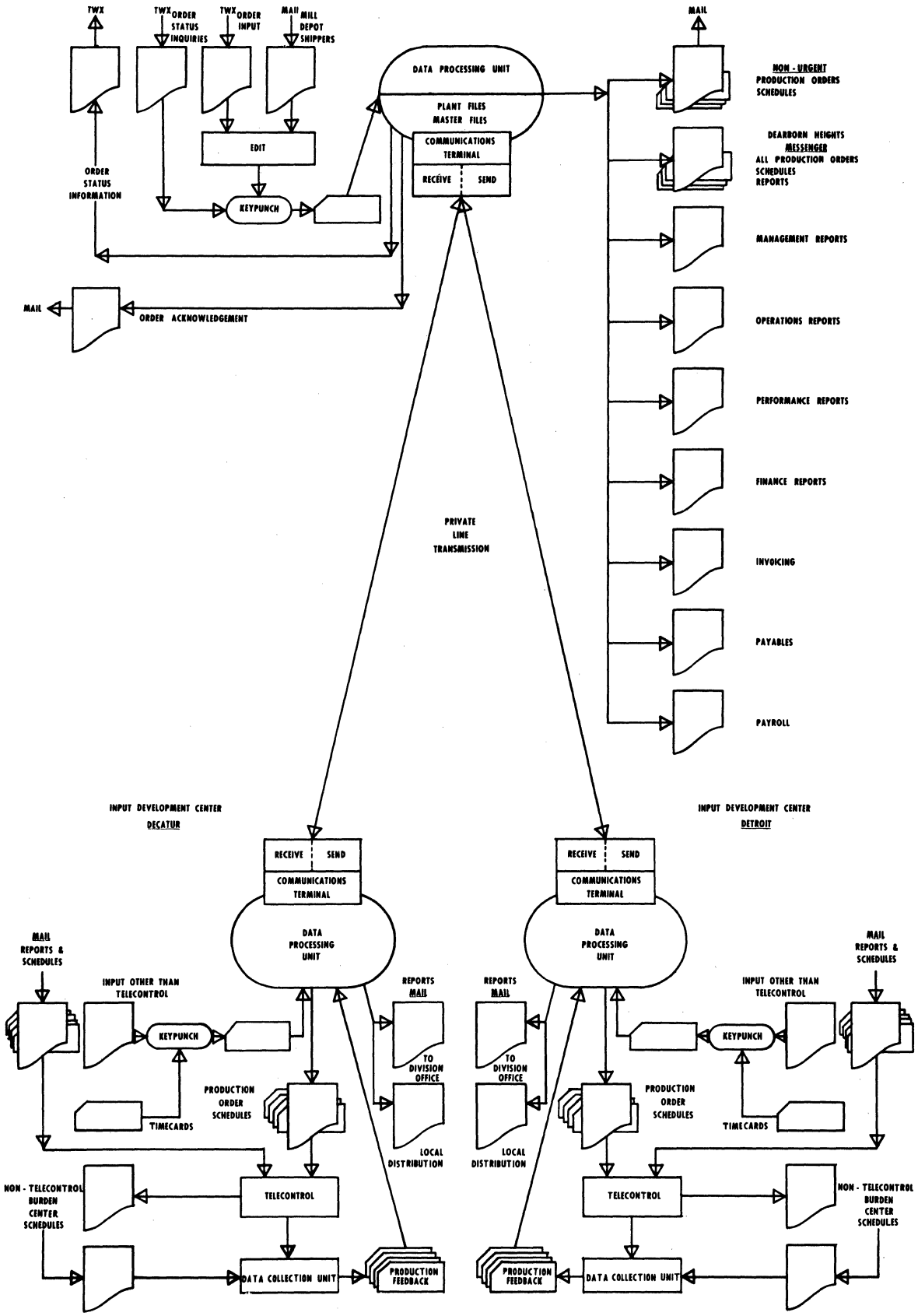
After the proposal was accepted, the next task was to select the appropriate hardware. The proposal was not predicated on any specific hardware, since the need was an improved system to which the hardware should be fitted; not a hardware proposal to which the system was to be geared. The equipment which the team thought necessary was, however, presented in concept form. Another by-product of the analysis was knowledge of the exact volume of data the computer had to transact. This information was given in identical packages to the three leading suppliers of hardware.



DIVISION DATA PROCESSING REPORTS

Input Document	Volume	Due In	Batch/Random	Time: KP Min.	Time: Proc. Min.	Report Type	Code	Report Title	Freq.	Average Lines	Average Characters	M
A/C Rec. Partial Payment Sheet	27	1st Wed.a.m.		60	10	Accounts Rec.	1	Balance Daily Cash Receipts	D	3,000	210,000	x
					10		2	Cash Receipts Register	D	1,000	490,000	x
A/C Rec. Debit Memo	40	1st Wed.a.m.		20	10		3	Balance Accounts Receivable Sales	Bi/W.	120	1,800	x
A/C Rec. Cr. Memo	20	1st Wed.a.m.		20	20		4	Sales Register	Bi/W.	320	29,760	x
					40		5	Customer Statements	15&31	24,000	960,000	
					30		6	Aging Report	W/ME	12,000	720,000	
					120		7	History Report	M	15,750	1,417,500	
					90		8	Customer Credit Guide by Customer	M	12,000	1,200,000	
					120		9	Customer Cr. Guide by Area & Customer	Q	16,000	1,600,000	
Shipping Report	40	1st Tue.a.m.		1200	10		10	Balance Cash Receipts by Customer No.	W/R	200	3,000	
Exception Billing	40	1st Tue.a.m.		60	10		11	Accounts Receivable Trial Balance	W	50	1,500	
					40	Plant Billing	12	Plant Check Sheets	D	3,000	150,000	x
					15		13	Plant Invoices	D	28,000	1,680,000	x
					40	Mill Depot Billing	14	Theoretical Weight Variances	D	900	45,000	3-4p
Mill Depot Shippers	2,700	1st Wed.a.m.		9600	20		15	Mill Depot Billing Check Sheet	D	8,000	400,000	3-4p
					30		16	Mill Depot Billing - Invoices	D	50,000	2,500,000	3-4p
					10		17	Mill Depot Sales Report	D	1,200	72,000	3-4p
A/C Pay. Vouchers	800	1st Thur.am		2760	10	Accounts Payable	18	Daily Voucher Register	D	1,650	82,000	x
					10		19	Daily Check Register	D	600	30,000	x
A/P Expense Con.Sheet	25	2nd Mon.a.m.		300	10		20	Balance 9100 Charges	M	40	400	
					10		21	Balance Dearborn Heights Charges	M	30	300	
					20		22	Dist. of Freight Out Costs	M	15	225	
					20		23	Dist. of Voucher Register	M	50	750	

THE EXACT AMOUNT OF DATA THE COMPUTER HAD TO TRANSACT WAS LISTED AND GIVEN TO THREE LEADING HARDWARE SUPPLIERS



A CHART INCORPORATING THE SUGGESTED HARDWARE REQUIREMENTS FOR THE NEW SYSTEM WAS PRESENTED

Hardware proposals were evaluated along several lines:

Conversion difficulty from existing to proposed	15%
Free support by hardware supplier	15%
Hardware capability, expansion, etc.	15%
Ease of programming, features, etc.	14%
Interim configuration	11%
Software	10%
Delivery	10%
Training offered	2%
Response to our needs in systems effort	4%
Miscellaneous	4%

Price was, of course, also considered, but on a separate basis.

The interim configuration, incidentally, was a temporary change in existing plant hardware, to attune plant procedures to the new system. The final plant configuration is minimal. From the proposals of the hardware suppliers, both cost as well as other ratings were made through a novel program developed in the Wolverine Tube Division.

The program considered each one of the eleven factors and their percentages, which are listed above. On a scale of 0-9 points, each hardware proposal was graded for each one of the eleven factors. Costs involved in each manufacturer's proposal were also considered in quarterly increments. All these elements were processed through the Wolverine Evaluation program. The program produced several cost graphs as well as a rating in point values of each proposal. This made a meaningful evaluation of proposals possible. After evaluation, approval was requested for a specific set of hardware. From the moment authorization to order the hardware was given, the timetable for conversion began on the implementation schedule.

The implementation schedule was set up to phase in both equipment and applications. Overlapping dates reflected the multiphase approach. The schedule organization was:

Equipment

Location A	Install intermediate configuration - Month 8.
Location B	Install intermediate configuration - Month 10.
Location C	Remove existing configuration - Month 24.
Location A	Install final configuration - Month 20.
Location B	Install final configuration - Month 24.

Applications

Location A

Order Processing	Finish by Month 16.
Scheduling	Finish by Month 36.
Marketing	Finish by Month 12.
Management Planning	Begin at Month 10.

Applications - Location A (continued)

Material Control	Begin at Month 8 - Finish at Month 20.
Work Order System	Begin at Month 20 - Finish at Month 22.
Engineering	Begin at Month 24.
Personnel Records	Begin at Month 6 - Finish at Month 18.
Finance	Begin at Month 6 - Finish at Month 36.

Location B

Eliminate and convert applications for processing at Location A.
Begin at Month 8 - Finish at Month 20.

Location C

As in B.
Prepare for final configuration - Begin at Month 20 - Finish at Month 24.

The total system effort was scheduled to revolve around the sales order and its metamorphosis into production order, loading and scheduling document, input for pricing, shipping and invoicing.

Objectives of the conversion were systems as well as data processing improvements. These were:

(1) Improvement of the sales order form to minimize salesman's writing time, give greater visibility to customer requirements and simplify data entry into the processing cycle.

(2) Minimize clerical effort in handling sales order data and subsidiary information. In this connection, time required in handling, evaluating, and otherwise manually processing the order (and its sub-systems), was minimized, reducing total cycle time and particularly minimizing the effect of change notices.

(3) Maximize amount of data extracted in the first pass of the sales order through the system. Some of this data is backlog, status, raw material requirements, and gross load.

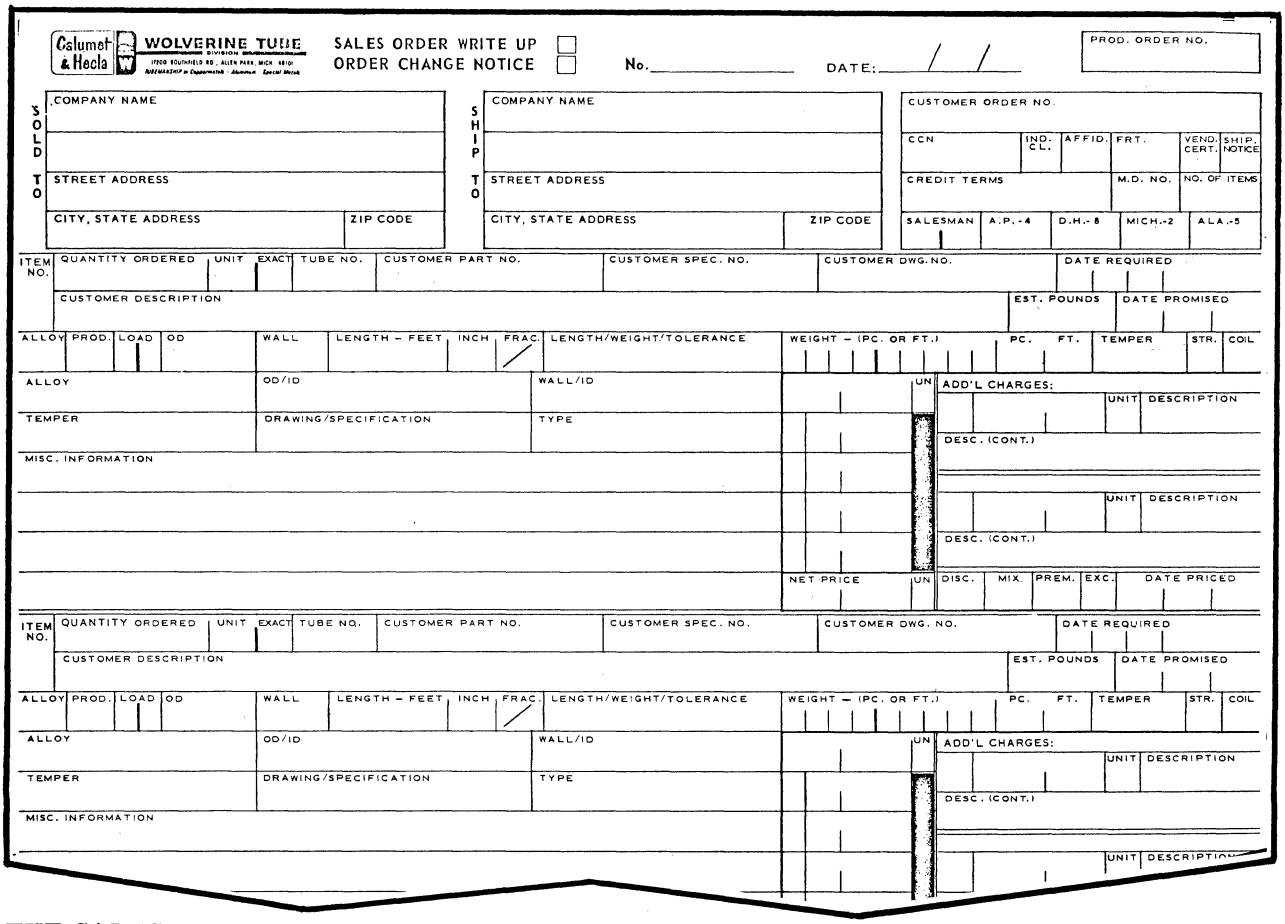
Among the hardware-connected improvements sought were:

(1) Establishment of a master file containing customer data (including typical data for automated order-editing and repeat orders).

(2) Decision tables on product data, including configuration and price variables.

(3) Electronically produced order status, receivables, pricing, backlog and work-in-process files and reports.

Earlier, there was a considerable potential gap in collecting receivables. The system was set up to recognize only the first and fifteenth day of the month as billing dates, even though billing took place at time of shipment. Now, the system is capable of billing on a daily billing data when necessary. This improvement tightens up the discount period and speeds up cash flow considerably. The improvement was made possible by the greater capability of the new computer as well as system changes.


Calumet & Hecla — WOLVERINE TUBE DIVISION

SALES ORDER WRITE UP ☐
ORDER CHANGE NOTICE ☐
No._____ DATE: / /
PROD. ORDER NO.

SOLD TO: COMPANY NAME; STREET ADDRESS; CITY, STATE ADDRESS; ZIP CODE
SHIP TO: COMPANY NAME; STREET ADDRESS; CITY, STATE ADDRESS; ZIP CODE
CUSTOMER ORDER NO.
CCN | IND. CL. | AFFID. | FRT. | VEND. CERT. | SHIP. NOTICE
CREDIT TERMS | M.D. NO. | NO. OF ITEMS
SALESMAN | A.P.-4 | D.H.-8 | MICH.-2 | ALA.-5

ITEM NO. | QUANTITY ORDERED | UNIT | EXACT | TUBE NO. | CUSTOMER PART NO. | CUSTOMER SPEC. NO. | CUSTOMER DWG. NO. | DATE REQUIRED
CUSTOMER DESCRIPTION | EST. POUNDS | DATE PROMISED
ALLOY | PROD. | LOAD | OD | WALL | LENGTH – FEET | INCH | FRAC. | LENGTH/WEIGHT/TOLERANCE | WEIGHT – (PC. OR FT.) | PC. | FT. | TEMPER | STR. | COIL
ALLOY | OD/ID | WALL/ID | UN | ADD'L CHARGES: | UNIT | DESCRIPTION
TEMPER | DRAWING/SPECIFICATION | TYPE | DESC. (CONT.)
MISC. INFORMATION
NET PRICE | UN | DISC. | MIX. | PREM. | EXC. | DATE PRICED

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ALLOY | OD/ID | WALL/ID | UN | ADD'L CHARGES: | UNIT | DESCRIPTION
TEMPER | DRAWING/SPECIFICATION | TYPE | DESC. (CONT.)
MISC. INFORMATION

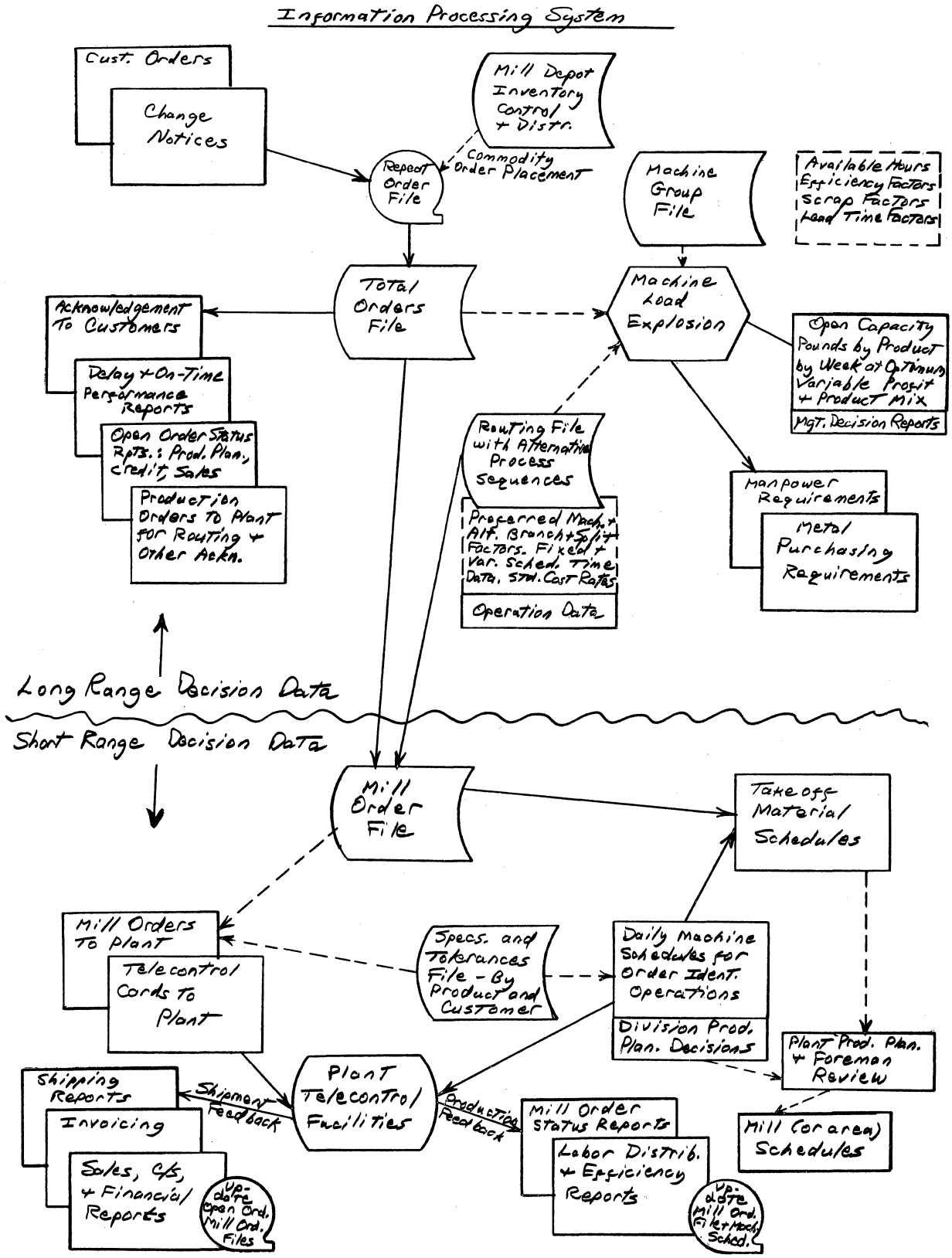
THE SALES ORDER WAS REVISED TO MINIMIZE WRITING TIME, GIVE GREATER VISIBILITY TO CUSTOMER REQUIREMENTS AND SIMPLIFY DATA ENTRY.

Obviously, this entire concept could not be turned into a workable system and implemented completely all at one time. The system design and implementation was scheduled to be accomplished on a multiple-phase approach. It was estimated that the total implementation would take 36 months. Not included in the schedule, but planned outside it was a program for the mathematical scheduling of the facility through computers.

Meanwhile, the order for the hardware having been placed, programing began for the conversion. Coordinators for the total conversion effort were appointed at each location and, at the same time, the necessary study and implementation committees were established. Committees had to concern themselves with a variety of tasks such as: file creation; product codes; repeat orders; "systems" description of the manufacturing process (routings); and scheduling.

By way of an example of the work involved, production scheduling had to be broken down further into: definition of gross scheduling and plant assignment; determination of files required, reporting needs, plant capacity, elements and priorities of plant selection, related classes of products and their interaction; design of plant load files, plant decision tables, data inputs and outputs, card/report formats; plan of related operational time schedules; program of loading routines and documentation; building test deck and tape files; test of selected order groups and producing sample outputs; modification and incorporation of exceptions in programs, inputs and outputs; institute and monitor.

All tasks, of course, were planned to take place nearly simultaneously and concurrently.



THIS SKETCH OF HARDWARE-CONNECTED IMPROVEMENTS TOOK INTO CONSIDERATION (1) CUSTOMER DATA, (2) DECISION TABLES ON PRODUCT DATA AND ELECTRONICALLY PRODUCED WORK-IN-PROGRESS FILES AND REPORTS

As the conversion took effect, promises to management were being realized, albeit with some modifications. These were made to capitalize on certain opportunities. For example, four items of keypunch equipment were replaced with two magnetic tape data recorders. The equipment used for the new system consists of a Honeywell 200, at Allen Park, with both disc and tape capability, and a Honeywell 120 with tape at Decatur. In the conversion, it was possible to drop one complete installation (Detroit) and reduce another with consequent savings in rentals and decreased staff. Finally, some changes were made because of hardware: disc memory was added earlier than planned because of the unavailability of another device. Naturally, with all these modifications came some replanning, most of it beneficial. Some changes, such as changes in the number of forms, redirection of work flow, etc. as the effort progressed, became visible throughout the division. Other changes were visible only to a few persons who worked with the procedures included: the open order file is an example.

Meanwhile, the data communications aspects of the conversion were tackled. Because the in-plant reporting equipment and system were already established, the new system was designed to tie in to the existing system. Outside communications, which could be modified nearly at will, were changed to suit this design.

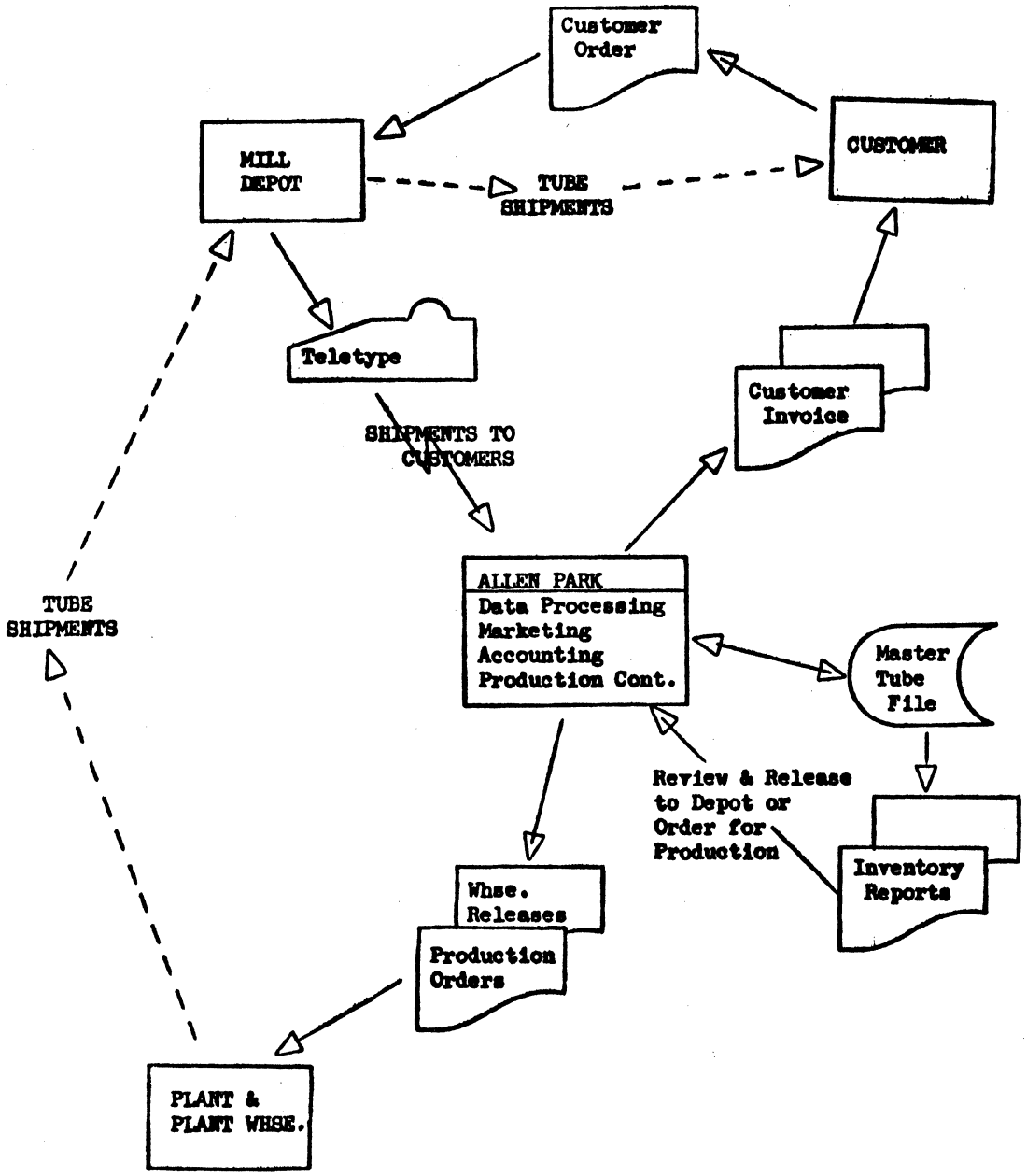
The survey of data traffic (which was one of the study phase by-products), showed where to make improvements in data transmission. Among other things, steps were taken to make sure that mill depots (warehouses) and district sales offices had compatible data transmission equipment. Presently, the computer at the input development center in Decatur began transmitting core to core to the central computer in Allen Park. The outlying computer has a core of 8K, capable of handling Cobol for incidental local applications.

As part of the conversion, a procedure was developed to integrate commodity and mill depot orders into the system. While all this work was being done, Wolverine Tube Division's programing staff carried on the task of converting existing programs so that they would run on the new hardware. In addition, they devoted considerable time to documenting and writing programs for the new system. This was one of the crucial aspects of the conversion. Another was the need for understanding and cooperation from all of the division's functional areas. To achieve this, considerable time was spent in training and "selling" presentations.

Some of the organizational changes made during or as a part of the conversion effort included the reassignment of system and computer responsibility to a newly-created administration function; communications and order editing were also assigned to administration, so that all of the communications and data processing activities -- particularly, as they deal with the customer's order -- are the responsibility of one man, the director of administration, who reports directly to the division general manager. In the plants, too, this responsibility is concentrated in one function, and reports at a correspondingly high level to make sure that proper emphasis on continued systems improvement is given.

With the new system, it becomes possible to control all shipments to and from warehouses, introduce forecasting and smoothing and linear programming techniques, in establishing actual inventory, order levels and automatic ordering from the factory. This is part of the updating routine for orders, shipments and work-in process control. In addition to improved control, several other savings, including personnel, were made possible.

Wolverine Tube Division will be able, through its successful systems conversion, to give its customers a precise delivery time on the basis of computerized production schedules, backed by a mathematical program. This program has been developed by one of the foremost consultants in this field, and is now in the installing stage. Division personnel have designed applications to optimize inventory levels and improve control over shipments for better service to the customers. Better order status information is now available so that not only divisional management but customers are better served. Other improvements are planned, aimed at giving even better service.



THIS FLOWCHART SHOWS HOW COMMODITY AND MILL DEPOT ORDERS ARE INTEGRATED INTO THE SYSTEM.