Appendix V

A Proposed Model of the Enterprise

A JAPANESE REFERENCE MODEL INCLUDING THE EXTERNAL INFLUENCES

The following material is an adaptation of a recent Japanese Industrial automation System Model (dated June 11, 1987, Anonymous) [20] used here to further define what is included and what is excluded from the present CIM Reference Model as described in this text.

Item A, Corporate Management and Staff Functions; Item B, Marketing and Sales; and Item C, Research, Development and Engineering of Table AIV-I all satisfy the definitions of External Influences as given above. Item D, Production management, Operations, Quality Assurance, Logistics and Cost Management Functions, are all items included in the Manufacturing Facility's task list (Tables 3-VI - 3-X, pp 31-34). Thus the present tables become another way to express the material of the later list.

Table AIV-II presents the source and sink locations and the function names of the tasks represented by a data-flow diagram whose communications links are described by the lines so enumerated. Note that these communication links connect the External Influences (Table AV-I, Items A, B, and C) with each other and with the factory itself (Item D of Table AV-I). This resulting data-flow diagram is thus much different from that described in Chapter 4. Figure AV-3 converts Table AV-II into a data-flow graph to show the interconnections involved.

Note that this model can only be descriptive and not mathematical because of the inclusions of the innovative functions. (See also Chapter 10 to see the description of the innovative function in the personnel staffing of a plant). The reader should further note that it has not been possible for the Committee to completely coordinate the descriptions and titles in the Japanese model with those of Chapters 3, 4, and 5 of the CIM Reference Model described in this text.

TABLE AV-I

TASKS OF THE SEVERAL ORGANIZATIONAL ENTITIES IN THE JAPANESE INDUSTRIAL AUTOMATION SYSTEM DESCRIPTIVE MODEL

A. Corporate Management and Staff (an external influence)

0 CORPORATE GOVERNANCE & MANAGEMENT

- 0.1 DIRECTION
- 0.2 STRATEGIC PLANNING
  - 0.2.1 BUSINESS AREA STRATEGIC PLANNING
  - 0.2.2 MANUFACTURING STRATEGIC PLANNING
- 0.3 FEASIBILITY STUDIES
  - 0.3.1 JUSTIFICATION OF CAPITAL INVESTMENT (FINANCIAL)
  - 0.3.2 R & D MANAGEMENT
  - 0.3.3 COST-BENEFIT ANALYSES (COST-EFFECTIVENESS ANALYSES)
- 0.4 RISK MANAGEMENT

1 CORPORATE STAFF FUNCTIONS

- 1.1 PURCHASING (PROCUREMENT CONTRACTS)
- 1.2 PERSONNEL (HUMAN RESOURCE MANAGEMENT)
- 1.3 TRANSPORTATION SERVICES (SHIPPING CONTRACTS)
- 1.4 ACCOUNTING

B. Marketing and Sales (an external influence)

2 MARKETING AND SALES

- 2.1 MARKET RESEARCH
- 2.2 ADVERTISING
- 2.3 SALES FORECASTS
- 2.4 MASTER SALES SCHEDULE
- 2.5 PRICING
- 2.6 SALES
- 2.7 WARRANTY SERVICE
- 2.8 PRODUCT LIABILITY

C. Research, Development and Engineering (an external influence)

3 R & D

- 3.0 R & D PLANNING
- 3.1 BASIC RESEARCH
- 3.2 APPLIED RESEARCH
- 3 3 PRODUCT DEVELOPMENT
  - 3 3.1 PRODUCT DEVELOPMENT
  - 3.3.2 DESIGN
  - 3.3.3 TRIAL PRODUCTION
  - 3.3.4 EXPERIMENT
- 3.4 MANUFACTURING DEVELOPMENT

4 PRODUCT DESIGN AND ENGINEERING

- 4.1 DEFINE PRODUCT SPECIFICATIONS
- 4.2 PRELIMINARY DESIGN & TESTING
- 4.3 DETAILED DESIGNS
- 4.4 DESIGN ANALYSES, TEST, EVALUATION
- 4.5 REVISE DESIGNS
- 4.6 RELEASE DESIGNS FOR PRODUCTION PLANNING

5 PREPRODUCTION PLANNING & ENGINEERING

- 5.1 PROJECT MANAGEMENT
  - 5.1.1 NEEDED TIME (FOR PRODUCTION)
    - 5.1.1.1 STANDARD NEEDED TIME
    - 5.1.1.2 NEEDED TIME IN EMERGENCY CASE
  - 5.1.2 CRITICAL PATH
  - 5.1.3 DEVELOP SCHEDULE CONTROL METHODS
  - 5.1.4 DEVELOP COST CONTROL METHODS (IN EXECUTION)

continued

Table V-1 continued

- 5.1.5 SET TARGET COSTS
- 5.2 ANALYSIS
  - 5.2.1 PRODUCTIVITY
  - 5.2.2 CAPACITY
  - 5.2.3 MAKE/BUY
  - 5.2.4 COST
  - 5.2.5 PROCESS
    - 5.2.5.1 CONTROL OF CAPACITY AVAILABLE
    - 5.2.5.2 TOLERANCE CHARTING
- 5.3 PROCESS PLANNING
  - 5.3.1 PROCESS SELECTION
  - 5.3.2 DEVELOP PROCESS ROUTING
  - 5.3.3 PROCESS PARAMETERS
  - 5.3.4 SELECT MACHINE TOOLS
  - 5.3.5 PURCHASE MACHINE TOOLS
- 5.4 TOOLING
  - 5.4.1 TOOLING REQMTS
  - 5.4.2 TOOLING DESIGN
- 5.5 LABOR STANDARDS
- 5.6 PLANT ENGINEERING
  - 5.6.1 PLANT LAYOUT
  - 5.6.2 PLANT REARRANGEMENT AND CONSTRUCTION
  - 5.6.3 INSTALLATION
- 5.7 BILL OF MATERIALS
- 5.8 QUALITY ASSURANCE PLANNING OF PRODUCTION
  - 5.8.1 VENDOR QUALIFICATION
  - 5.8.2 RAW MTL. SPEC.
  - 5.8.3 IN-PROCESS Q/C PLAN
    - 5.8.3.1 WIP GAGING/TESTING
    - 5.8.3.2 WIP AUDIT
  - 5.8.4 PRODUCT AUDIT PROCEDURES

6 SOFTWARE DEVELOPMENT FOR PRODUCTION

- 6.1 CAM (NC PROGRAMMING)
  - 6.1.1 SCULPTURED SURFACES PROGRAMMING
  - 6.1.2 LATHE PROGRAMMING
  - 6.1.3 TWO DIMENSIONAL PROGRAMMING
  - 6.1.4 PROGRAMMING FOR MACHINE CONTROLS (INCLUDE ROBOTS)
  - 6.1.5 PROGRAM MAINTENANCE
- 6.2 CAT (PROGRAMMING FOR TEST & INSPECTION)
  - 6.2.1 PROGRAMMING FOR INSPECTION CONTROLLER
  - 6.2.2 CALCULATION OF RESULTS AND FEEDBACK
- 6.3 PROCESS CONTROL PROGRAMMING
  - 6.3.1 PROGRAMMING FOR MATERIAL HANDLING (ROBOTS, AGV, WAREHOUSE)
  - 6.3.2 PROCESS CONTROL SIMULATION
  - 6.3.3 OFF-LINE PROGRAMMING (FOR SUCH AS CHIP MANAGEMENT AND COMMUNICATION MANAGEMENT)

7 INFORMATION SYSTEM AND MANAGEMENT

- 7.1 SYSTEM SOFTWARE
- 7.2 DATABASE MANAGEMENT SYSTEM (DBMS)
- 7.3 LAN (LOCAL AREA NETWORK)
- 7.4 WAN (WIDE AREA NETWORK)
- 7.5 SYSTEM AUDIT

D. Production Management, Operations, Quality Assurance, and Support, Logistics, and Cost Management (part of the Purdue CIM Reference Model)

8 PRODUCTION MANAGEMENT

- 8.1 MASTER PRODUCTION SCHEDULE
- 8.2 PRODUCTION & INVENTORY CONTROL
- 8.3 PROGRAM STORAGE & DISTRIBUTION
- 8.4 PRODUCTION MONITORING
- 8.5 MAINTENANCE

continued

Table V-1 continued

- 8.5.1 SCHEDULED MAINTENANCE
- 8.5.2 CORRECTIVE MAINTENANCE
- 8.5.3 SPARES SUPPLY
- 8.6 QUALITY CONTROL
- 8.7 COST CONTROL

9 PERFORM PRODUCTION OPERATIONS

- 9.1 MATERIAL (RAW & WORK IN PROCESS) STORES
- 9 2 TRANSPORT MATERIAL
- 9.3 TRANSFORMATION
- 9.4 INCOMING INSPECTION
- 9.5 VENDOR PERFORMANCE
- 9.6 IN PROCESS GAGING/TESTING
- 9.7 IN PROCESS AUDIT
- 9.8 PRODUCT AUDIT

10 PRODUCTION SUPPORT

- 10.1 PROCUREMENT
- 10.2 GENERAL STORES
- 10.3 TOOL CONTROL
- 10.4 MAINTENANCE
  - 10.4.1 SCHEDULE MAINTENANCE
  - 10.4.2 CORRECTIVE MAINTENANCE
- 10.5 PLANT SECURITY
  - 10.5.1 FIRE & WATCH
- 10.6 ENERGY MANAGEMENT
- 10.7 TIME & ATTENDANCE
- 10.8 ENVIRONMENT CONTROL
- 10.9 HEALTH & SAFETY
- 10.10 WASTE MATERIAL TREATMENT

11 LOGISTICS

- 11.1 RECEIVING
- 11.2 WAREHOUSING AND SHIPPING

12 COST MANAGEMENT

- 12.1 PROFITABILITY ANALYSES
- 12.2 MANAGEMENT TO TARGET COSTS
- 12.3 COST ESTIMATING
- 12.4 SYSTEM PERFORMANCE TRACKING

TABLE AV-II

INTERCONNECTIONS IN THE INDUSTRIAL AUTOMATION SYSTEM (IAS)

Part A: Information Flow Included in the Data Flow Diagram - Figure 2-3

FROM	TO	TYPE OF DATA	Information Content of Data
0.2.1	2.X	SD	MARKETING POLICY
0.3	2.1	S	PROJECT PLANNING
0.3.3	12.X	S	COST BENEFITS ANALYSIS
0.3.2	3.X	S	R & D POLICY
2.1	0.X	SD	MARKETING POLICY
2.6	11.2	S	DELIVERY ORDER
2.6	8.2	S	CUSTOMER ORDERS
2.4	8.1	S	MASTER SALES SCHEDULE
2.1	4.X	S	MARKET RESEARCH (NEEDS)
2.3	5.1	S	SALES PROJECTIONS
2.7	4.2	S	QUALITY REQUIREMENTS
2.8	5.8	SD	QA PLANNING
3.X	4.X	S	NEW TECHNOLOGY
4.4	2.5	SD	EST. PRODUCT COST
4.6	2.2	SD	PRODUCT DESCRIPTION
4.6	5.X	SD	PRODUCT DESCRIPTION
4.6	11.X	SD	PRODUCT DESCRIPTION
4.6	7.2	SD	PRODUCT DESCRIPTION
4.6	6.X	SD	PRODUCT DESCRIPTION
4.6	5.3	SD	PRODUCT DESCRIPTION
4.6	12.3	SD	PRODUCT DESCRIPTION
4.6	9.4	SD	PRODUCT DESCRIPTIONA
5.1	11.2	S	PRODUCTS DELIVERY
5.7	11.1	S	PROCUREMENT DEMAND
5.2.4	2.6	SD	EST. PRODUCT COST
5.7	8.2	SD	BILL OF MATERIALS
5.7	8.1	SD	BILL OF MATERIALS
5.7	8.5	SD	BILL OF MATERIALS
5.3	8.2	SD	DETAILED PROCESS PLAN
5.3	8.4	SD	DETAILED PROCESS PLAN
5.3	6.3	SD	PROCESS PLANNING
5.4	6.X	S	TOOLING

continued

Table V-2 continued

FROM	TO	TYPE OF DATA	Information Content of Data
5.2.2	6.X	S	DETAIL ROUTING
5.8	6.2	SD	QA PLANNING
5.1.4	12.X	S	COST CONTROL
5.2.1	4.3	S	PRODUCIBILITY REQUIREMENTS
5.2.4	4.4	S	PRODUCTION COST
5.X	7.6	S	SYSTEM AUDIT
6.1	8.3	S	NC MACHINE PROGRAM
6.2	8.3	S	TEST & INSPECTION PROGRAM
6.3	8.3	S	PROCESS CONT. PROGRAM
6.X	8.3	SD	M/C CONTROL DATA
6.1	9.4	S	NC INSPECTION PROGRAM
7.2	5.X	S	DATABASE MANAGEMENT
8.2	10.1	S	PURCHASING ORDER
8.5	10.4	S	MAINTENANCE REQUESTS
8.2	9.3	S	WORK ORDERS
8.2	9.2	S	MOVE ORDERS
8.3	9.3	SD	M/C CONTROL DATA
8.1	5.2	SD	CAPACITY CONSTRAINTS
8.6	5.8	S	QUALITY PERFORMANCE
8.1.4	2.4	SD	CAPACITY CONSTRAINTS
8.2	2.6	S	DELIVERY DATES
9.3	10.3	S	TOOLING REQUISITIONS
9.3	10.2	S	STORES REQUISITIONS
9.X	8.X	S	STATUS
12.2	4.4	S	COST REQUIREMENTS

In the context above the symbols S and SD have the following meanings:

S Data used locally by only one activity, module or function.

SD Data used by two or more activities, modules or functions.

Part B: Some Important Data Flows Not Included in Figure 2-3

FROM	TO	TYPE OF DATA	Information Content of Data
5.8	8.6	S	QUALITY CONTROL STANDARDS
7.X	9.X	S	INFORMATION SYSTEM OPERATIONAL CAPABILITIES
8.7	12.4	S	COST DATA
8.5	10.4	S	MAINTENANCE REQUIREMENTS
9.1	8.2	SD	INVENTORY STATUS
9.2	8.3	SD	MATERIAL MOVEMENT DATA
9.3	8.3	SD	PRODUCTION DATA
9.4	8.6	S	QUALITY CONTROL DATA - RAW MATERIALS
9.6	8.6	SD	QUALITY CONTROL DATA - IN PROCESS
9.7	8.6	SD	QUALITY CONTROL DATA - IN PROCESS
9.8	8.6	SD	QUALITY CONTROL DATA - PRODUCTS
10.2	8.2	SD	INVENTORY STATUS
10.4	8.5	S	MAINTENANCE RESULTS
10.1	8.2	S	CONFIRMATION OF PROCUREMENT
12.3	8.7	S	PRODUCTION COST GOALS

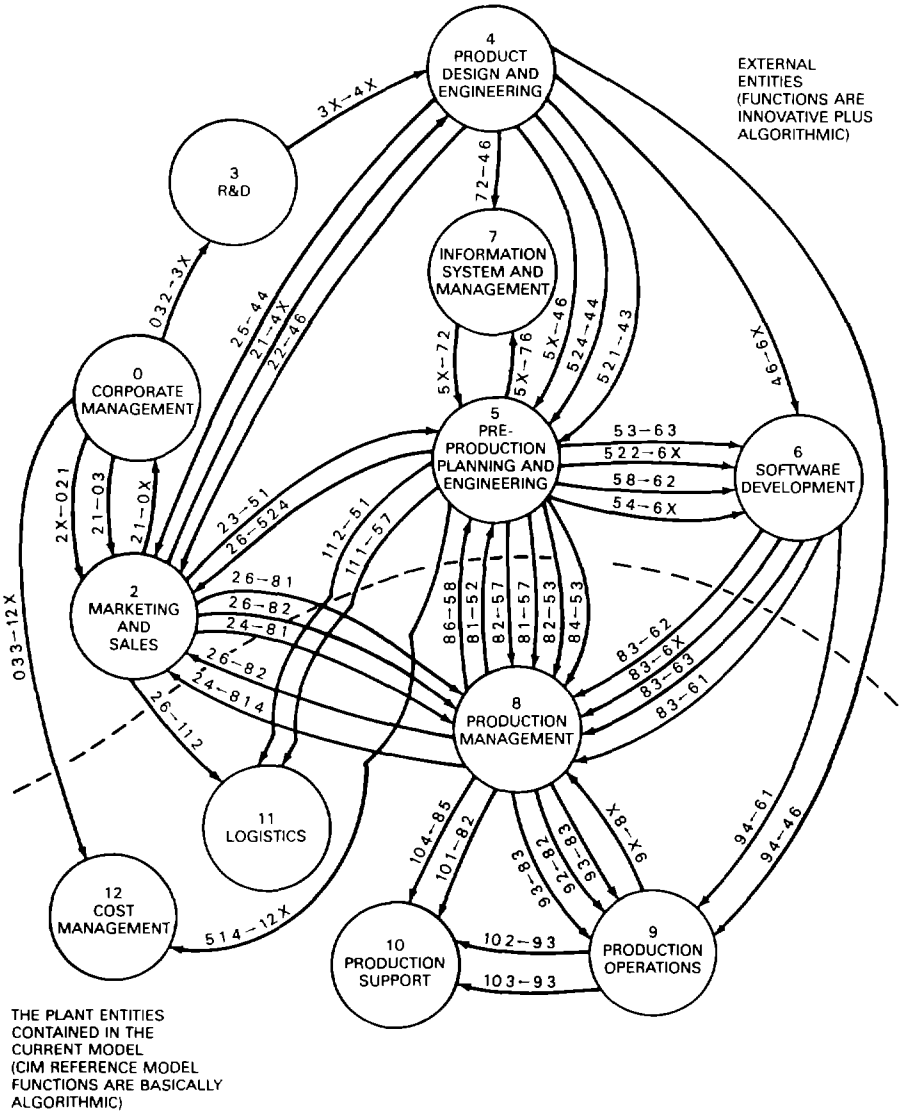

Figure AV-1 Data Flow Diagram Japanese Model of the Enterprise.