HARRIS CORPORATION - SEMICONDUCTOR SECTOR (B)

Binu Koshy prepared this case under the supervision of Professor Peter Bell, Richard Ivey School of Business, the University of Western Ontario, solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

John Cornell, President of Harris Semiconductor, had spoken to the entire sector on company-wide closed-circuit television, and had given his strong support to a project to build a new planning system by stating "…[this] is the most important project in the sector, and everyone must do whatever is necessary to expedite the project and to insure its success. (Harris Semiconductor) sector will not survive unless we solve our delivery problem."

The On-Time Delivery Problem

Shortly after Harris Corporation acquired the GE Solid State (GESS) semiconductor product lines and manufacturing facilities from General Electric in 1988, on-time delivery emerged as a crisis issue: the percentage of ordered line items delivered within one day of the promised delivery date hovered around 75 percent, and one survey indicated that 60 percent of Harris' customers wished to replace the company as a vendor. Potential sales of $100 million had been lost in 1989, and sales continued to decline in the following years. What once was a profitable division of the corporation reported a loss of $75 million in fiscal year 1991. Getting its products delivered on time emerged as a critical issue for the corporation. If the semiconductor sector was to survive, Harris had to solve this problem.

The Emergence of IMPReSS

The Harris project team sketched out a system which they named **IMPReSS**, from *I*ntegrated *M*anufacturing *P*roduction *Re*quirements *S*cheduling *S*ystem, designed to provide sector-wide production planning and delivery quotations.

The IMPReSS concept incorporated a number of subsystems and databases collectively designed to automated the planning process (Figure 1). Fundamental to this new system was the IMPReSS "planning engine", a critical piece of software which had to be able to calculate a company-wide production plan for all Harris Semiconductor's products, and manufacturing sites worldwide. The IMPReSS engine was to be supported by a number of other systems (Figure 1).

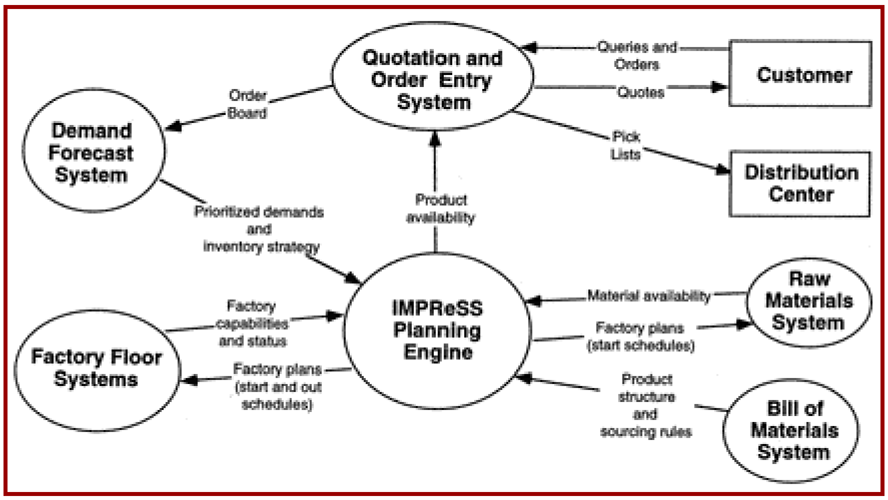

Figure 1: The IMPReSS Concept

The Supporting Systems

The Quotation and Order Entry System

An on-line quotation and order entry system was planned to provide delivery quotations to customers, accept customer orders, and send pick lists to distribution centers.

This system would maintain, in real time, a schedule of product availability, which was a schedule of the uncommitted portion of the production plan. As inquiries were received from customers, the system would calculate the "best" delivery schedule that could be offered, and then reserve product for the customer. When a customer order was finalized, the system would process the order and include it on the "order board," which was a list of current customer commitments. If the order did not materialize, the reservation would be canceled and the reserved supply of product would revert back to the availability. This system would also prioritize shipments to customers from finished goods inventory, and furnish order picking lists to the product distribution centers.

Demand Forecast System

The demand forecast system would periodically receive the order board from the order entry system, and utilizing the current order board as supporting information, the system would prepare market forecasts for each finished goods type. These forecasts would serve as inputs to production-planning calculations.

Since Harris normally could not accommodate all market demands promptly within the capacity of their existing manufacturing facilities, the production-planning decision calculations would require more information than just the demand forecasts for each product. It was proposed to partition the forecasts into subsets of demands with different priorities, established from a sales or marketing viewpoint, and the relative priorities of these demand subsets were to form an input to the planning engine. As an example, demands that represented customer orders took priority over demands that represented the unrealized (and uncertain) portion of sales forecasts. In addition, forecasted sales of a high margin custom product would have priority over forecasted sales of a lower margin product, given that the two forecasts were equally reliable. The demands communicated to the planning engine by the forecast system would, therefore, be sorted into priority classes.

Raw Materials System

A materials system was planned to track and procure raw materials and to supply the planning engine with the availability of raw materials which constrained the production plan. After calculation of the production plan, the planning engine would supply the materials system with the planned product starts for each manufacturing area, from which it could calculate material requirements.

Factory Floor Systems

For each manufacturing area, factory floor systems maintained the status of work-in-process (WIP) and static product inventory. These systems included applications to convert WIP into an equivalent projected out schedule (a WIP-out projection) for the manufacturing area. These systems also included databases for maintaining models of factory capability which described the routes followed by products through the factory, including relevant data about the operations on each route, such as manufacturing yields, cycle times, equipment processing rates, and equipment capacities. From these data, these systems would provide the planning engine with inputs concerning factory capabilities and status. After calculating a worldwide plan, the planning engine would pass back factory schedules of lots releases and completions (*starts* and *outs*) for which it would be held accountable.

Bill-of-Materials System

A bill-of-materials (BOM) system would supply the planning engine with the official product structure and sourcing rules. These data would specify the sites authorized to produce each final or intermediate product, and each product's alternative source products on the next lower level of the product structure. The BOM data would also be used by the order entry system to insure that it did not issue delivery quotations for products currently in engineering "hold" status or not yet passing qualification tests.

The IMPReSS Planning Engine

While all these supporting systems were critical to the proper functioning of the overall planning and quotation system, the planning engine embodied most of the decision-making logic and was the backbone of the whole structure. The plan was to schedule all the manufacturing areas located around the world in a single *planning cycle* of the engine.

A planning cycle would consist of three phases:

- Requirements planning, in which inventory and work-in-process were subtracted from the prioritized demands to determine net demands for new starts in back-end and front-end production;

- Capacitated loading, in which the net demands were loaded onto the manufacturing sites according to the priorities subject to resource availabilities; and

- Computation of the new product availability, in which order board demands were subtracted from the production plan to determine the supply of products available for new delivery quotations.

The design of the planning engine had to reflect the sector's marketing priorities and concerns, where the total demand for any product in a given time period included different types of demand with different priorities. Planners had to divide the total forecast for each product in each time period into *priority classes* defined by marketing and sales management.

Each priority class belonged to one of three types:

- Order-board classes: those that represented external or internal delivery commitments (confirmed orders, contractually guaranteed supply, scheduled test lots for product development, firm demands and so forth);

- Inventory replenishment classes which represented replenishment of safety stocks; and

- Forecast classes which represented projections of future customer demands.

In strict priority order, order-board classes preceded inventory classes, which preceded forecast classes. The engine, therefore, had to provide maximum service to previous customers' commitments and replenish safety stocks before making product available for future customer commitments. In addition, it had to resolve resource competition among products within the individual classes.

Finally they had to control inventory risk. The project team though that this could be accomplished by defining a *build-to-level code* for each finished good indicating the corporate inventory point to which production could be carried out without corresponding customer orders on hand.

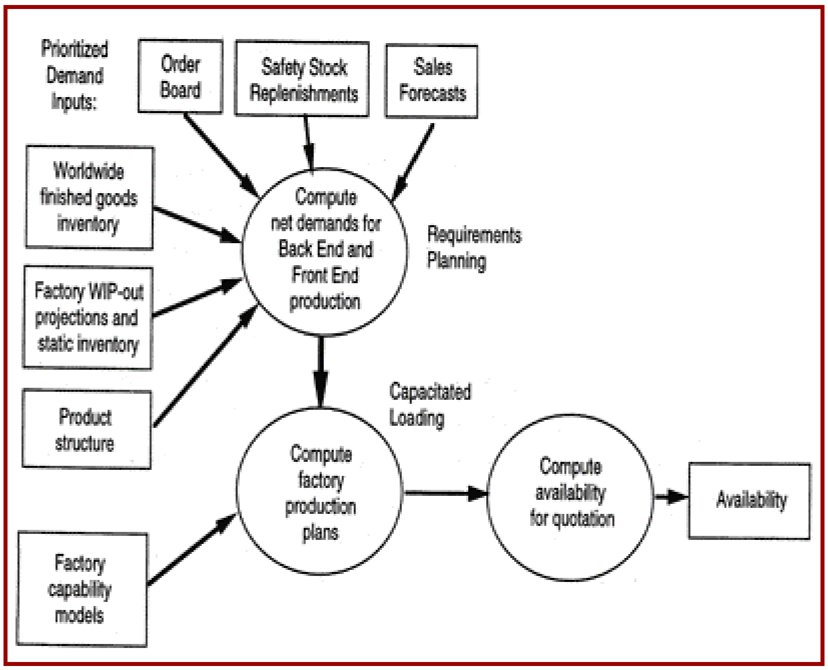

Figure 2: The IMPReSS Planning Engine

The key to this whole effort to save Harris Semiconductor Sector was the IMPReSS planning engine (Figure 2). The project team now faced the task of specifying this software. How could the various elements which made up this large and complex planning problem be solved?