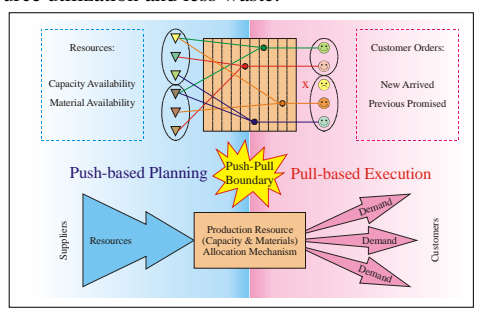


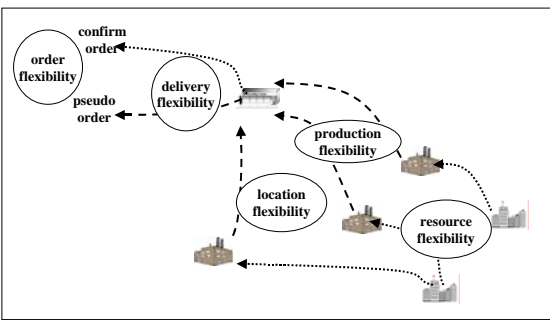
Advanced ATP

- An execution mechanism that allocates and re-allocates available resources, including raw materials, work-in-process, finished goods, and even production and distribution capacities, in response to actual customer orders
- Advanced ATP synchronizes and matches the forecast-based push and order-driven pull “forces” to lower stock-out, higher resource utilization and less waste.



Flexibilities in ATP Environment

- Customer order flexibility – high profit orders vs. low profit orders, confirmed orders vs. pseudo orders
- Production flexibility – regular time vs. overtime
- Location flexibility – order splitting and re-pointing
- Transportation flexibility – express mode vs. regular mode
- Resources flexibility – expedite or de-expedite.

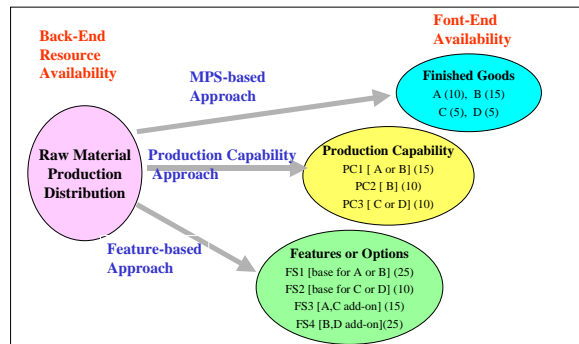


Multiple Performance Measures

- Customer service level -- Due date violation, loss sales, etc.
- Total revenue – Committed orders times sales price.
- Total cost – Holding cost, production cost, transportation cost.
- Production and transportation smoothness & utilization

Real-Time ATP

- Response and order commitment are given for each customer order *immediately* after order receipt based on pre-allocated resource availability
- Back-end resource availability including material, production capacity, distribution capacity are required to be pre-allocated into front-end availability at either SKU level, or options (features) level, or finished goods level to increase promising speed



Batch-mode ATP

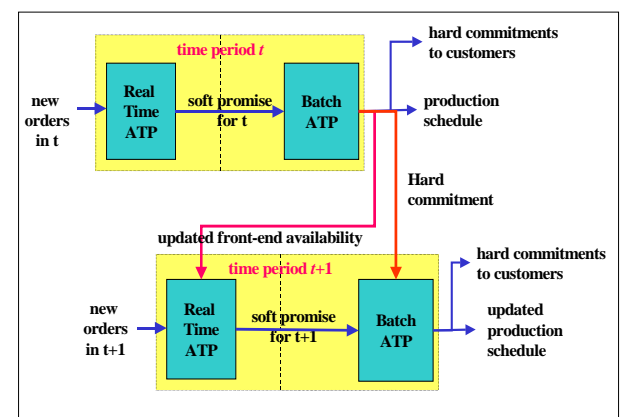
- Customer orders are collected *over a predetermined “batching interval”* (e.g., one hour, 8-hour shift, one day) and response and order commitment are generated for a batch of orders at the end of each batching interval.

MIP Formulation

- Major decision variables
 - $Z^k(t)$: Order accept or deny indicator (0/1) for order k in time t
 - $X_m^k(t)$: Delivery indicator (0/1) for order k in delivery mode m
 - $D_m^k(t)$: Quantity delivery for order k via mode m in factory f
 - $Y_f^k(t)$: Production indicator (0/1) for order k in factory f and time t
 - $Q_f^k(t)$: Quantity produced for order k in factory f and time t
- Objective Function
 - Minimize: revenue + customer service – total cost
- Constraints
 - ✓ Order promising and fulfillment constraints
 - ✓ Delivery assignment constraints
 - ✓ Production assignment constraints
 - ✓ Material conservation
 - ✓ Production capacity requirements constraints
 - ✓ Delivery capacity requirements constraints
 - ✓ Material substitution and compatibility

Two-Stage ATP

- Customer orders are responded and committed immediately with initial “soft” order confirmation by real-time ATP then given “hard” order delivery date after checking more detail resource availability based on batch ATP.



Applications of Batch ATP in Toshiba

- Data was collected for an electronic product (EP)
 - ✓ ATP Time Horizon: 9 weeks
 - ✓ Customer Orders: 4994
 - ✓ Product Models: 4355
 - ✓ Available Resources: 765 MOs, 456 PCs with 5-20 candidates

	C-ATP	A-ATP	Differences
Total due date violation (qty*date)	429016	351521	-18.1%
Total inventory holding cost (qty*date)	1614023	1577228	-2.3%
Production quantity by flexible resources	18439	15797	-14.3%

Pareto frontier for 2 objective criteria:

- Single run takes 6 minutes

