Introduction to ERP

Brad Staats

Peak enterprise solutions
ENGAGE • TRANSFORM • ACHIEVE
What is ERP?

Enterprise resource planning (ERP) systems integrate internal and external management information across an entire organization. The purpose of ERP is to facilitate the flow of information between all business functions inside the boundaries of the organization and manage the connections to outside stakeholders.

Classic Benefits of ERP

- Reduced inventory (FG, WIP, RAW)
- Increased productivity
- Reduced quote-to-cash cycle time
- Increased flow
- Improved availability of information
- Reduced costs

Classic Pitfalls of ERP

- Garbage in, garbage out
- Automation of poor processes
- Customization of software
- Implemented as an afterthought
Typical Metrics Used

- Performance measurements
  - Inventory turns
  - Output
  - ROI
  - Benchmarking
  - Overall process cycle times
  - Paperwork cycle times
  - Quality of product or service
  - On-time complete
  - On-time delivery
Adapted from Langenwalter, Gary A. *Enterprise Resources Planning and Beyond* (St Lucie Press/APICS Series on Resource Management, 2000)
The Final Analysis: What is an ERP system?

- A framework for
  - Organizing
  - Defining
  - Standardizing
  - Managing
  - Data
ERP Concepts

- Sales and Marketing
- Manufacturing
- Material Management
- Human Resources
- Finance and Accounting
- Engineering and Quality
- Information Technology
- Executive Information
Customer Relationship Management (CRM)

- Customer information
- Customer communication
- Order quoting
- Order entry
- Order confirmation
- Order allocation
- Change orders
- Shipment history
- Customer returns
At each level we must answer these questions:

- What are the demand priorities?
- What capacity is required?
- What capacity is available?
## Order Cycle and Lead Times

<table>
<thead>
<tr>
<th>Process Description</th>
<th>External Time</th>
<th>Internal Time</th>
<th>Internal Time</th>
<th>Internal Time</th>
<th>External Time</th>
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</thead>
<tbody>
<tr>
<td>Order Preparation</td>
<td>2 days</td>
<td>1 day</td>
<td>14 days</td>
<td>1 day</td>
<td>1 day</td>
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<tr>
<td>and Transmittal</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Order Receipt</td>
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<tr>
<td>and Entry</td>
<td></td>
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</tr>
<tr>
<td>Inventory Allocation</td>
<td></td>
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<tr>
<td>and Manufacturing</td>
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<tr>
<td>Order Shipment</td>
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<td></td>
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<tr>
<td>and Invoicing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shipping and Receipt</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total lead time = 19 days**
Master Scheduling

Finished Products

WIP

Raw Materials

MTS

MTO or ETO

ATO or Mass Customization
Planning Factors

- Safety Stock
- Volume Hedge
- Mix Hedge
- Market Hedge
- Safety Lead Times
- Safety Capacity
Product Structure

End Item Q
Lead Time = 1

Part R (1)
Lead Time = 3

Part S (3)
Lead Time = 2

Part T (4)
Lead Time = 3

Part U (1)
Lead Time = 2

RM 1 (5)
Lead Time = 2

RM 2 (30)
Lead Time = 2

Lead time in weeks
Inventory Management

- Managing raw material, work in process, and finished goods inventory as groups
- Financially oriented
- Requires transaction control
- Location control
  - Fixed locations
  - Random locations
  - Zoned locations
- Involves
  - Flow and kind of inventory needed
  - Supply and demand patterns
  - Functions inventory performs
  - Objectives of inventory management
  - Costs associated with inventory
The MRP Model

- Master Production Schedule
  - Inventory data
  - Bills of Material
  - Planning factors
  - Schedule of planned production order releases
  - Schedule of planned purchase order releases
  - Action notices

The MRP Model integrates inventory data, bills of material, and planning factors to create a master production schedule. This schedule then informs the creation of action notices and production releases, ensuring that the production process is well-planned and managed efficiently.
MRP Netting Logic

- Computes gross requirements
- Subtracts available material
- Computes net requirements
- Time phases all levels of requirements

- Assists in keeping order due dates valid
- Furnishes information to capacity planning system
- Plans gross requirements for components
- Provides forward visibility
- Assumes infinite capacity
Changes That Affect the Plan

- MPS revisions
- Engineering changes
- Inventory corrections
- Scrap in excess of plan
- Changes in lot sizes
- Customer order revisions
- Supplier or production problems
Capacity Management

- Theoretical capacity
- Maximum demonstrated capacity
- Rated capacity
- Demonstrated capacity
- Productive capacity (non-constraint)
- Productive capacity (constraint)
## Routing Data

### Part T Routing

<table>
<thead>
<tr>
<th>Operation</th>
<th>Work Center</th>
<th>Run Time</th>
<th>Setup Time</th>
<th>Move Time</th>
<th>Queue Time</th>
<th>Total Time</th>
<th>Rounded Time</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>.3</td>
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<td>1.7</td>
<td>2.0</td>
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</tbody>
</table>

Total lead time (days) = 15.0

### Part U Routing

<table>
<thead>
<tr>
<th>Operation</th>
<th>Work Center</th>
<th>Run Time</th>
<th>Setup Time</th>
<th>Move Time</th>
<th>Queue Time</th>
<th>Total Time</th>
<th>Rounded Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>1.3</td>
<td>.5</td>
<td>.3</td>
<td>1</td>
<td>3.1</td>
<td>3.0</td>
</tr>
<tr>
<td>2</td>
<td>105</td>
<td>.2</td>
<td>.1</td>
<td>.3</td>
<td>.5</td>
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<td>1.0</td>
</tr>
<tr>
<td>3</td>
<td>106</td>
<td>.3</td>
<td>.2</td>
<td>.1</td>
<td>1.5</td>
<td>2.1</td>
<td>2.0</td>
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<tr>
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<td>.8</td>
<td>1.5</td>
<td>3.9</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Total lead time (days) = 10.0
Purchase Order Control

- Planned orders
  - Standard Pricing
  - Alternative Pricing
  - Last Pricing

- Open orders
  - Preferred Vendor
  - Alternative Vendor
  - Lead Time

- Closed orders
  - Standard Description
  - Vendor Description, P/N

- Invoice
  - Order Date
  - Due Date

- Payment
## Scheduling and Loading

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward scheduling:</td>
<td>Activities are scheduled from a start date with the completion date of an order computed</td>
</tr>
<tr>
<td>Backward scheduling:</td>
<td>Activities are scheduled back from the due date</td>
</tr>
<tr>
<td>Infinite loading:</td>
<td>Assumes capacity is infinite at any work center</td>
</tr>
<tr>
<td>Finite loading:</td>
<td>Assumes there is a definite limit to capacity at any work center</td>
</tr>
</tbody>
</table>
Production Reporting

Feedback on what is actually happening plant wide and by work center and by order

- Order status
- Exception reports – scrap, rework, inspection holds
- Inventory status – produced and consumed
- Labor reports – time and attendance, applied labor
- Machine performance
- Shipping/Receiving
- Interface to G/L
Engineering and Quality Management

- Quality requirements - product and process
- Inspection holds and testing results
- Serial number and lot control & associated data
- Disposition tracking
- Genealogy tracking
- Engineering change control
- Receiving inspection
- Customer return analysis
- Corrective actions
Accounting & HR

- Invoicing
- Cash receipts
- Vender payments
- General ledger
- Financial reporting
- Time reporting/Payroll
- Personnel records
- Performance review history
- Benefits tracking
IT Management

- User security
- Data access
- Reporting
- Modifications
- Technical support
- User support
- Implementation support
- Executive dashboard
# ERP and Lean

## Lean Performance Organization

### Managing Change
- Performance Paradigm Change
- New Product Development
  - Supply Chain
  - Value Stream Mapping
- Lean Performance Progress
- Strategic Planning and S&OP
  - Theory of Constraints
- Achieve Continuous Improvement
  - Pull / Kanban
  - POUS
  - Standardized Work
  - Lean Office
  - Cellular Flow
  - Quality at Source
  - Kaizen
  - Visual - 5-S
  - TPM
  - Quick Changeover
  - Poke-a-Yoke
  - Plant Layout

### Team Building / Training
- Value Stream Mapping

### Culture Shift

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