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Operations Management

Chapter 14

Material Requirements Planning

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Chapter 14

Materials Requirements Planning

- Material Requirements Planning (MRP)
- MRP Logic and Product Structure Trees
- Time Fences
- MRP Example
- MRP II
- Lot Sizing in MRP Programs

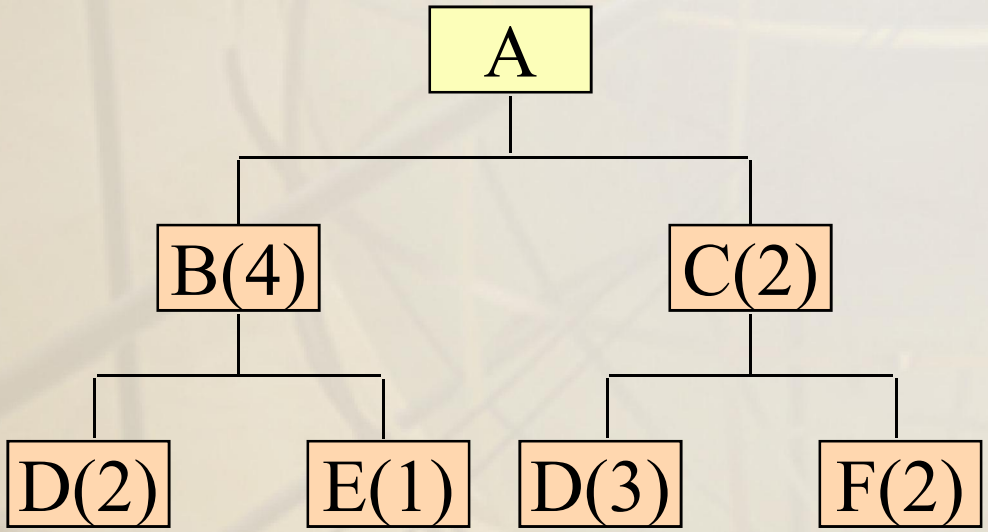
Material Requirements Planning *Defined*

- Materials requirements planning (MRP) is the logic for determining the number of parts, components, and materials needed to produce a product.
- MRP provides time scheduling information specifying when each of the materials, parts, and components should be ordered or produced.
- Dependent demand drives MRP.
- MRP is a software system.

Example of MRP Logic and Product Structure Tree

Given the *product structure tree* for "A" and the lead time and demand information below, provide a materials requirements plan that defines the number of units of each component and when they will be needed.

Product Structure Tree for Assembly A



Lead Times

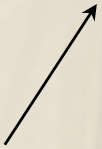
A	1 day
B	2 days
C	1 day
D	3 days
E	4 days
F	1 day

Demand

Day 10	50 A
Day 8	20 B (Spares)
Day 6	15 D (Spares)

First, the number of units of "A" are scheduled backwards to allow for their lead time. So, in the materials requirement plan below, we have to place an order for 50 units of "A" in the 9th week to receive them in the 10th week.

	Day:	1	2	3	4	5	6	7	8	9	10
A	Required										50
	Order Placement									50	



LT = 1 day

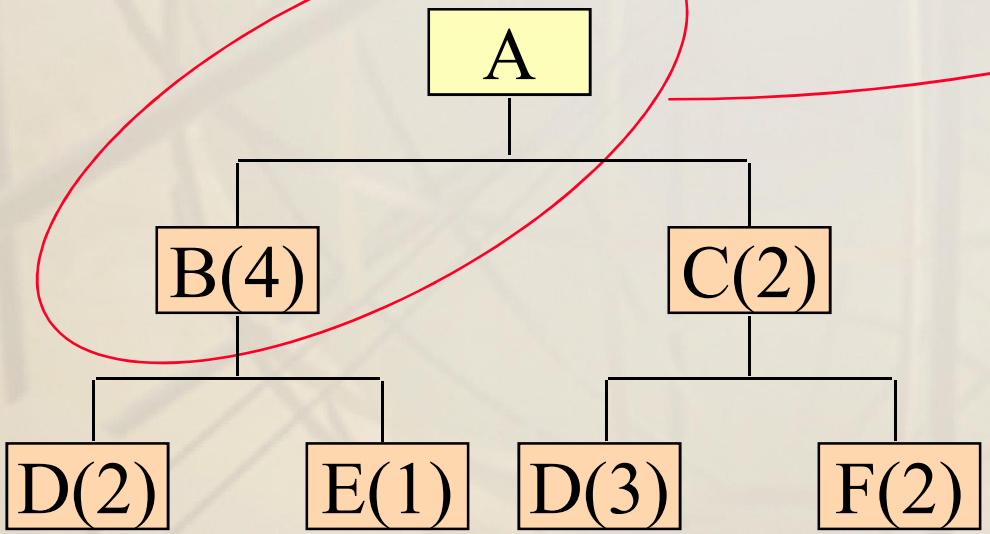
Next, we need to start scheduling the components that make up "A". In the case of component "B" we need 4 B's for each A. Since we need 50 A's, that means 200 B's. And again, we back the schedule up for the necessary 2 days of lead time.

	Day:	1	2	3	4	5	6	7	8	9	10
A	Required										50
	Order Placement									50	
B	Required								20	200	
	Order Placement						20	200			

LT = 2

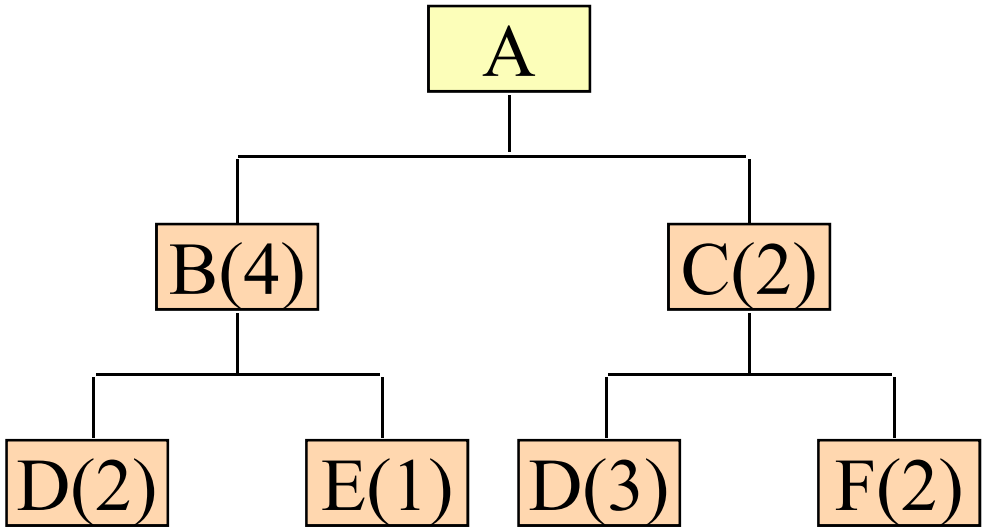
Spares

4x50=200



Finally, repeating the process for all components, we have the final materials requirements plan:

	Day:	1	2	3	4	5	6	7	8	9	10
A	Required										50
LT=1	Order Placement									50	
B	Required								20	200	
LT=2	Order Placement						20	200			
C	Required									100	
LT=1	Order Placement								100		
D	Required						55	400	300		
LT=3	Order Placement			55	400	300					
E	Required						20	200			
LT=4	Order Placement		20	200							
F	Required								200		
LT=1	Order Placement							200			



Part D: Day 6

40 + 15 spares

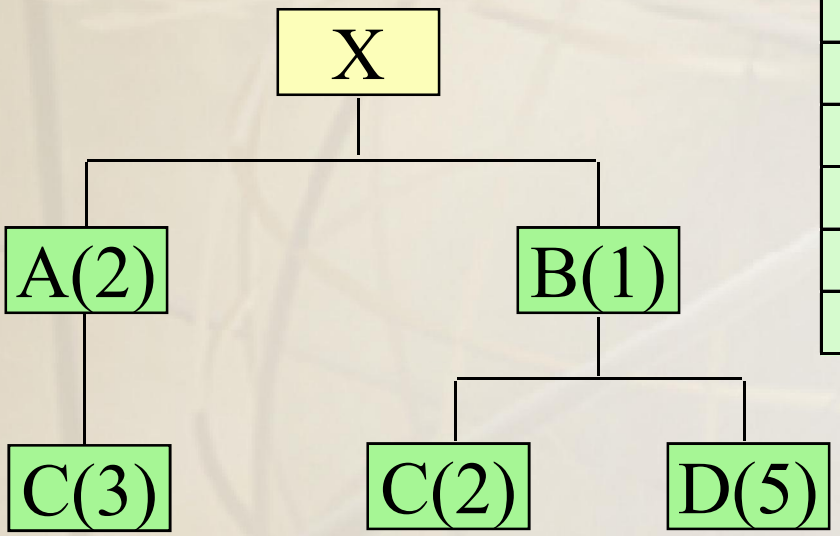
Additional MRP Scheduling Terminology

- Gross Requirements
- On-hand
- Net requirements
- Planned order receipt
- Planned order release

Bill of Materials (BOM) File
A Complete Product Description

- Materials
- Parts
- Components
- Production sequence
- Modular BOM
  - Subassemblies
- Planning BOM
  - Fractional options

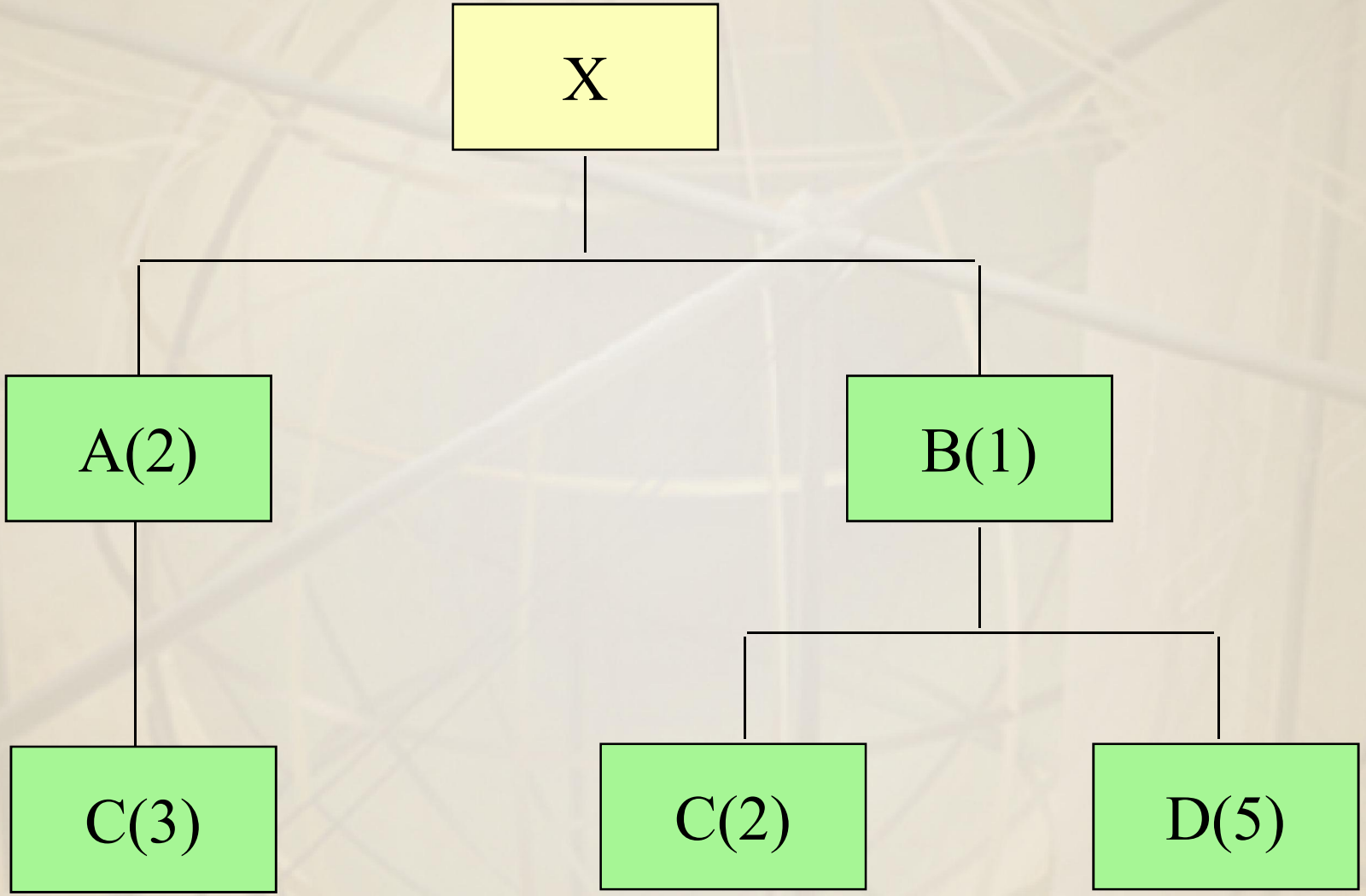
MRP Example



Item	On-Hand	Lead Time (Weeks)
X	50	2
A	75	3
B	25	1
C	10	2
D	20	2

Requirements include 95 units (80 firm orders and 15 forecast) of X in week 10 plus the following spares:

Spares	1	2	3	4	5	6	7	8	9	10
A									12	
B							7			
C								10		
D						15				



	Day:	1	2	3	4	5	6	7	8	9	10
X	Gross Requirements										95
LT=2	On-Hand=50										50
	Net Requirements										45
	Planned Order Receipt										45
	Planner Order Release								45		
A	Gross Requirements								90	12	
LT=3	On-Hand=75								75		
	Net Requirements								15	12	
	Planned Order Receipt								15	12	
	Planner Order Release					15	12				
B	Gross Requirements							7	45		
LT=1	On-Hand=25							7	18		
	Net Requirements								27		
	Planned Order Receipt								27		
	Planner Order Release							27			
C	Gross Requirements					45	36	54	10		
LT=2	On-Hand=10					10					
	Net Requirements					35	36	54	10		
	Planned Order Receipt					35	36	54	10		
	Planner Order Release			35	36	54	10				
D	Gross Requirements						15	135			
LT=2	On-Hand=20						15	5			
	Net Requirements							130			
	Planned Order Receipt							130			
	Planner Order Release					130					

Types of Time Fences

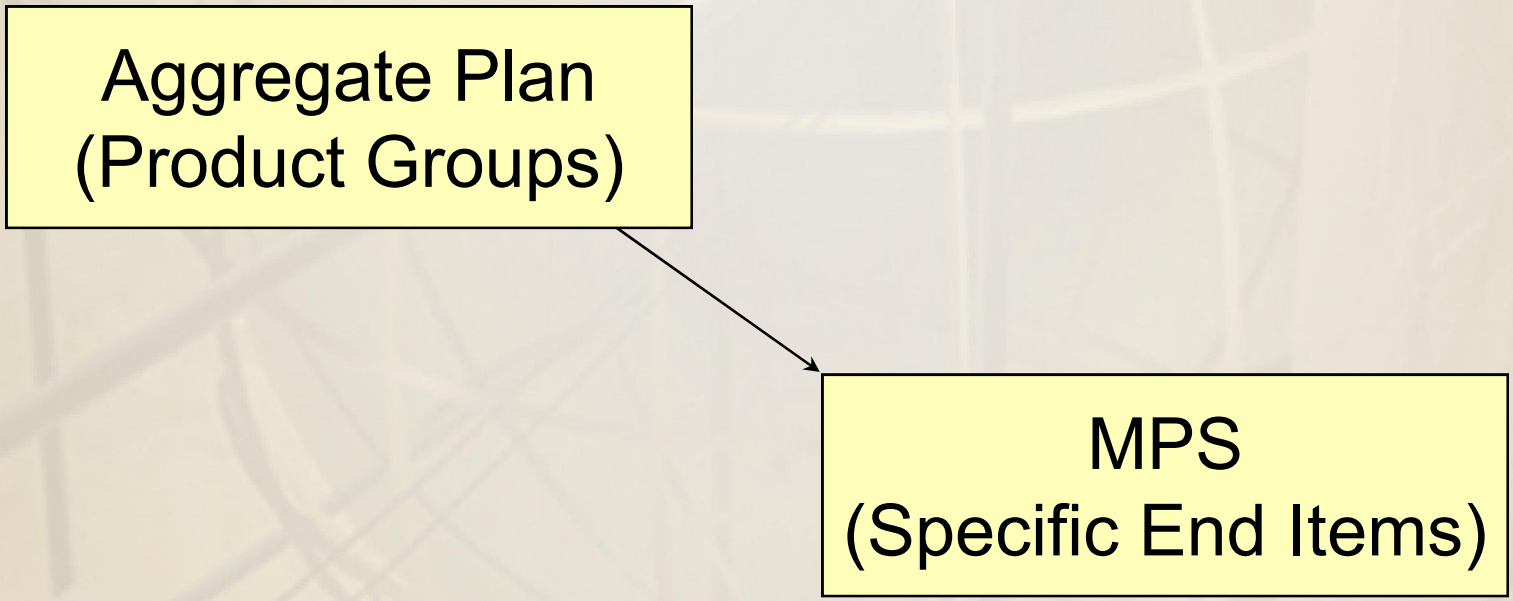
- Frozen
  - No schedule changes allowed within this window.
- Moderately Firm
  - Specific changes allowed within product groups as long as parts are available.
- Flexible
  - Significant variation allowed as long as overall capacity requirements remain at the same levels.

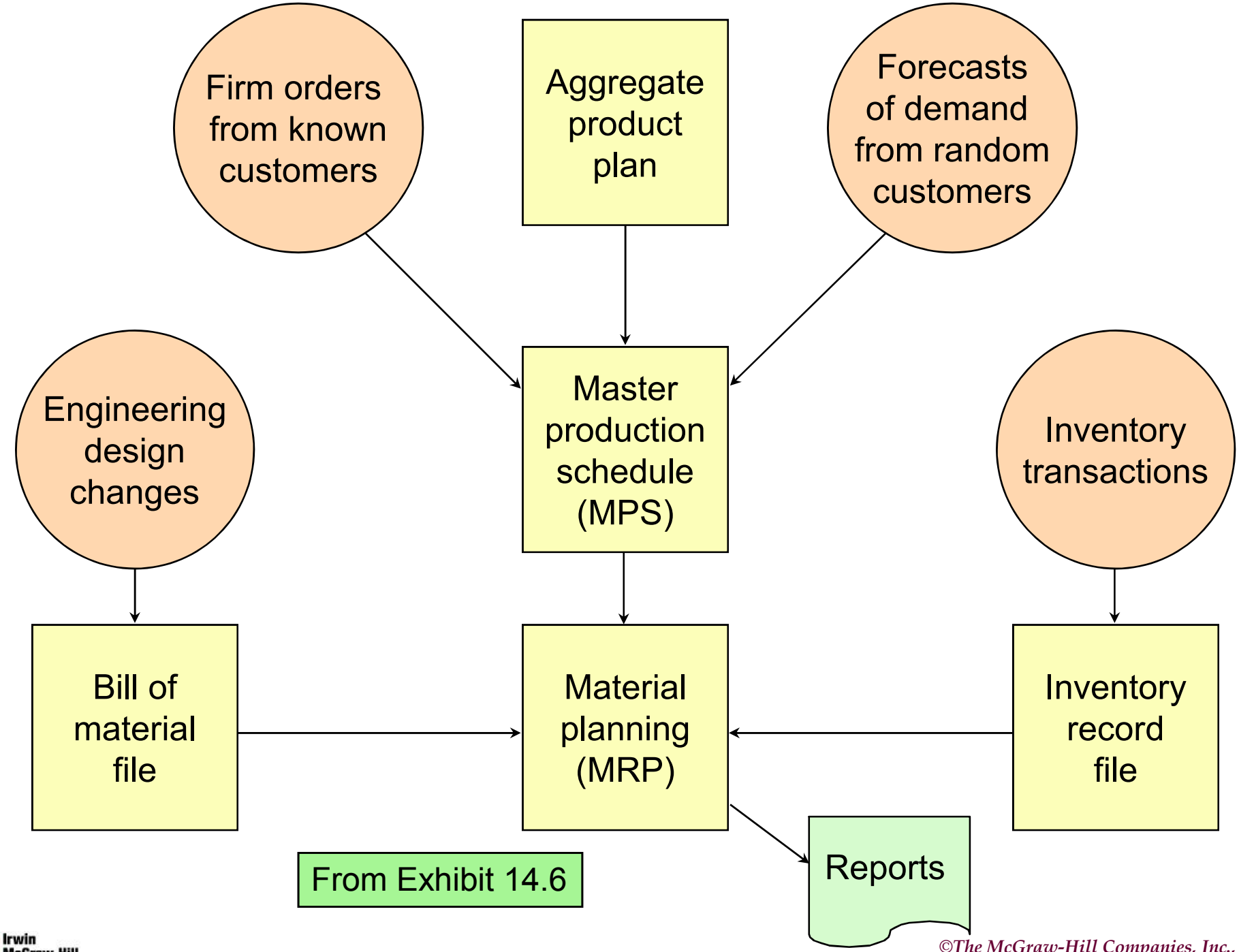
Material Requirements Planning System

- Based on a master production schedule, a material requirements planning system:
  - Creates schedules identifying the specific parts and materials required to produce end items.
  - Determines exact unit numbers needed.
  - Determines the dates when orders for those materials should be released, based on lead times.

Master Production Schedule (MPS)

- Time-phased plan specifying *how many* and *when* the firm plans to build each *end item.*

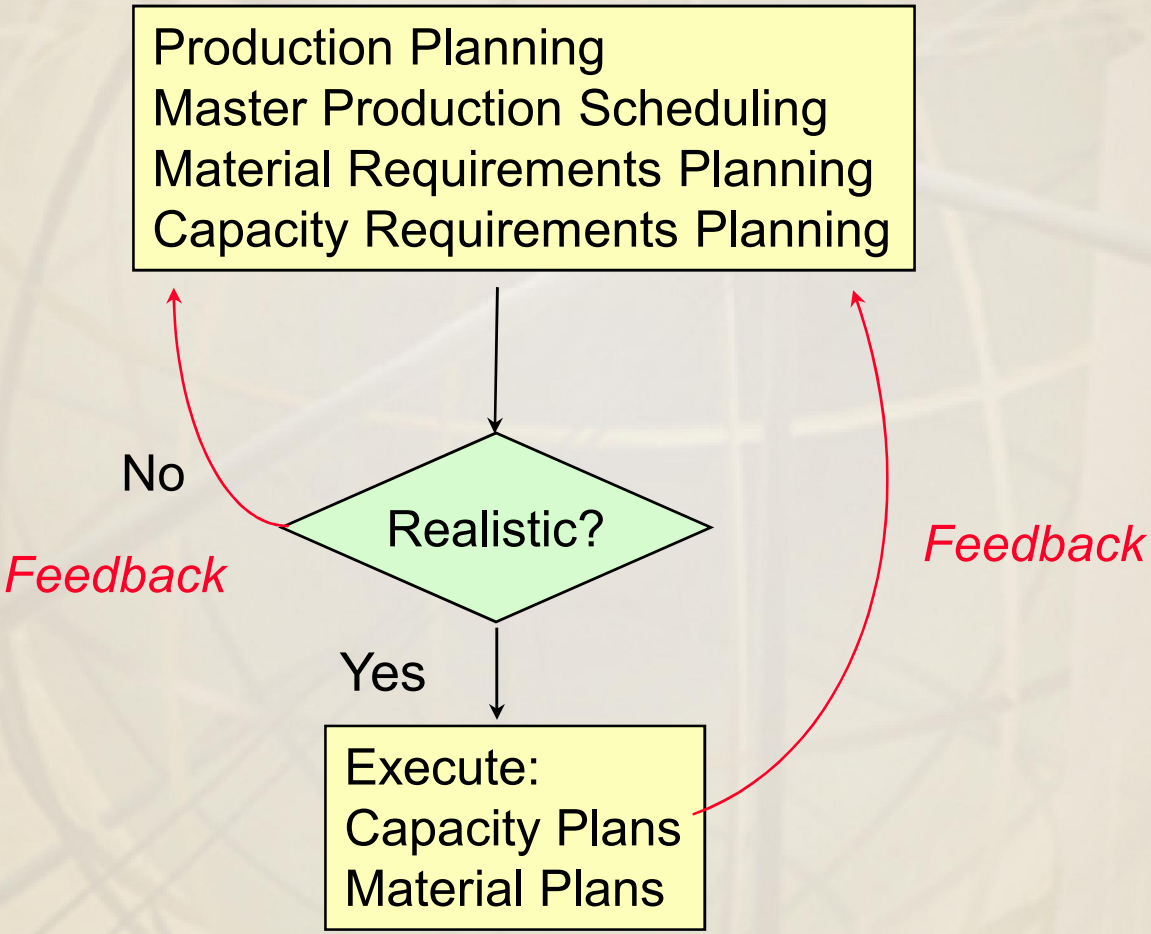




Self study

- Advantage of MRP
- Disadvantage of MRP

Closed Loop MRP



Lot Sizing in MRP Programs

- Lot-for-lot (L4L)
- Economic order quantity (EOQ)
- Least total cost (LTC)
- Least unit cost (LUC)