INDUSTRIAL ENGINEERING

Lesson 11
Material Requirement Planning

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Synopsis

This chapter introduces master production schedule (MPS) & MRP. The concept of bill of material (BOM), gross material requirement, and net material requirement plan will be addressed. Finally, safety stock will be introduced.

Expected Outcome

1. Understand the concept of MPS and MRP.
2. Explain the concept of BOM, gross material requirement, and net material requirement plan.
3. Develop MRP for a production process.
4. Consider safety stock in developing MRP.

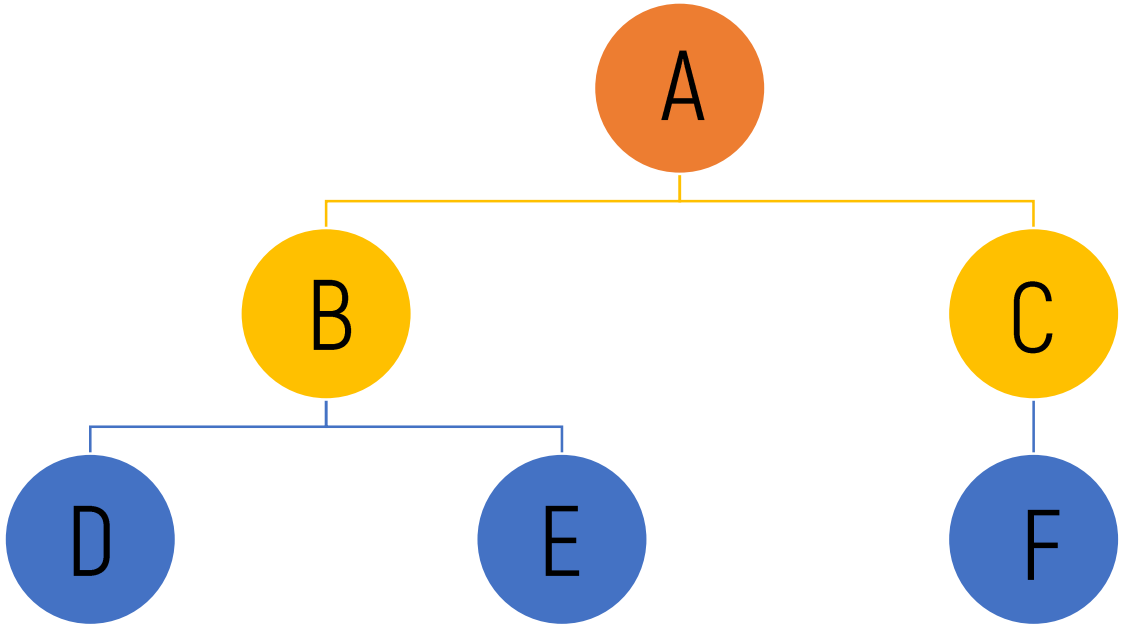
What is MRP?

A dependent demand technique, which uses a BOM, inventory, expected receipts, & a MPS to determine material requirement.

Benefits of MRP

1. Better response to customer orders
2. Faster response to market changes
3. Improved utilization of facilities & labor
4. Reduced inventory levels

Dependent Demand vs Independent Demand



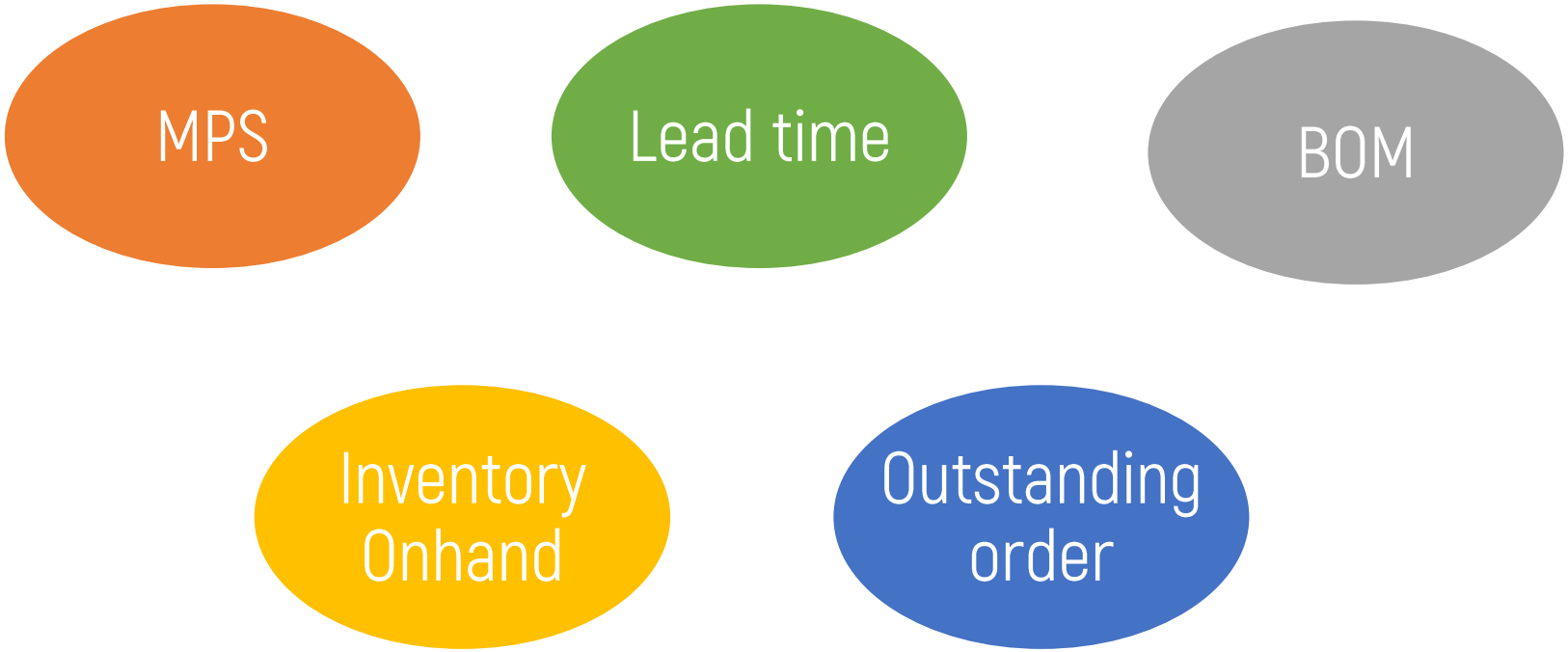
Dependent demand:

All components of a product are dependent.

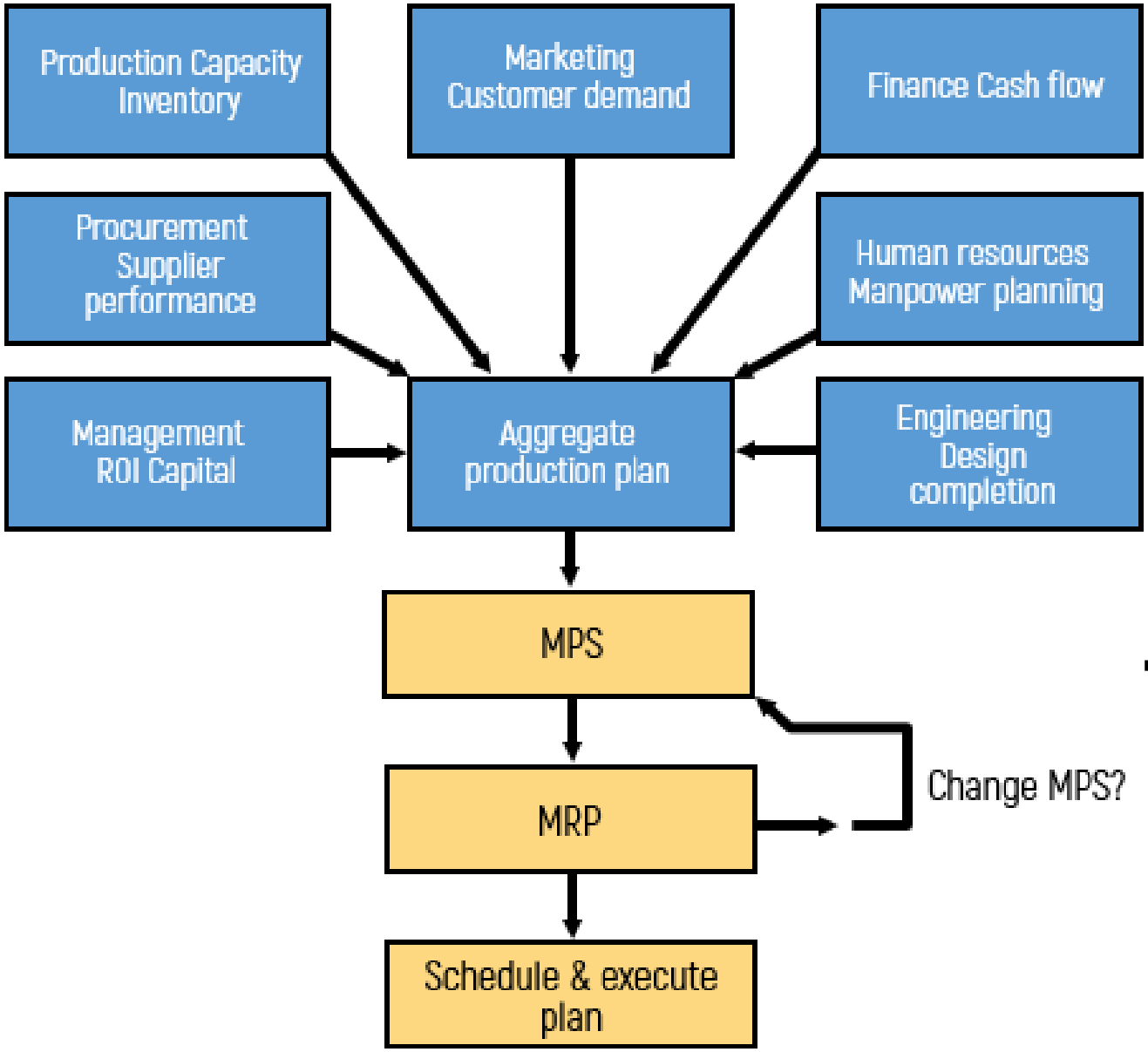
Independent demand:

Demand at the end product level.

Requirement for effective MRP



The Planning Process



Source: Heizer & Render (2014)

MPS

MPS indicates what to be made & when.

MPS disaggregates the aggregate plan.

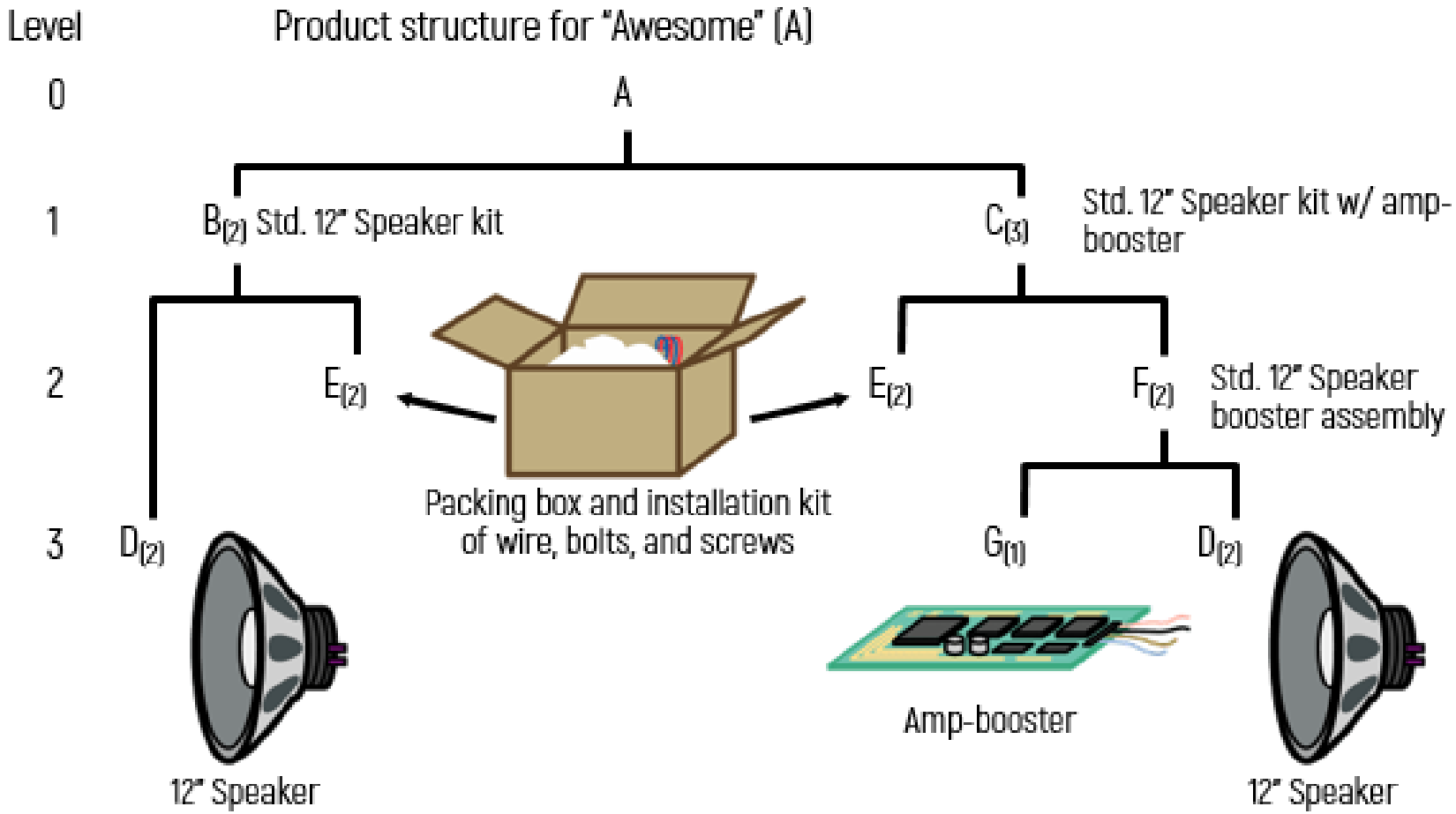
From Aggregate Plan to MPS

Months	January				February			
Aggregate Production Plan (Shows the total quantity of amplifiers)	1,500				1,200			
Weeks	1	2	3	4	5	6	7	8
Master Production Schedule (Shows the specific type & quantity of amplifier to be produced								
240-watt amplifier	100		100		100		100	
150-watt amplifier		500		500		450		450
75-watt amplifier			300				100	

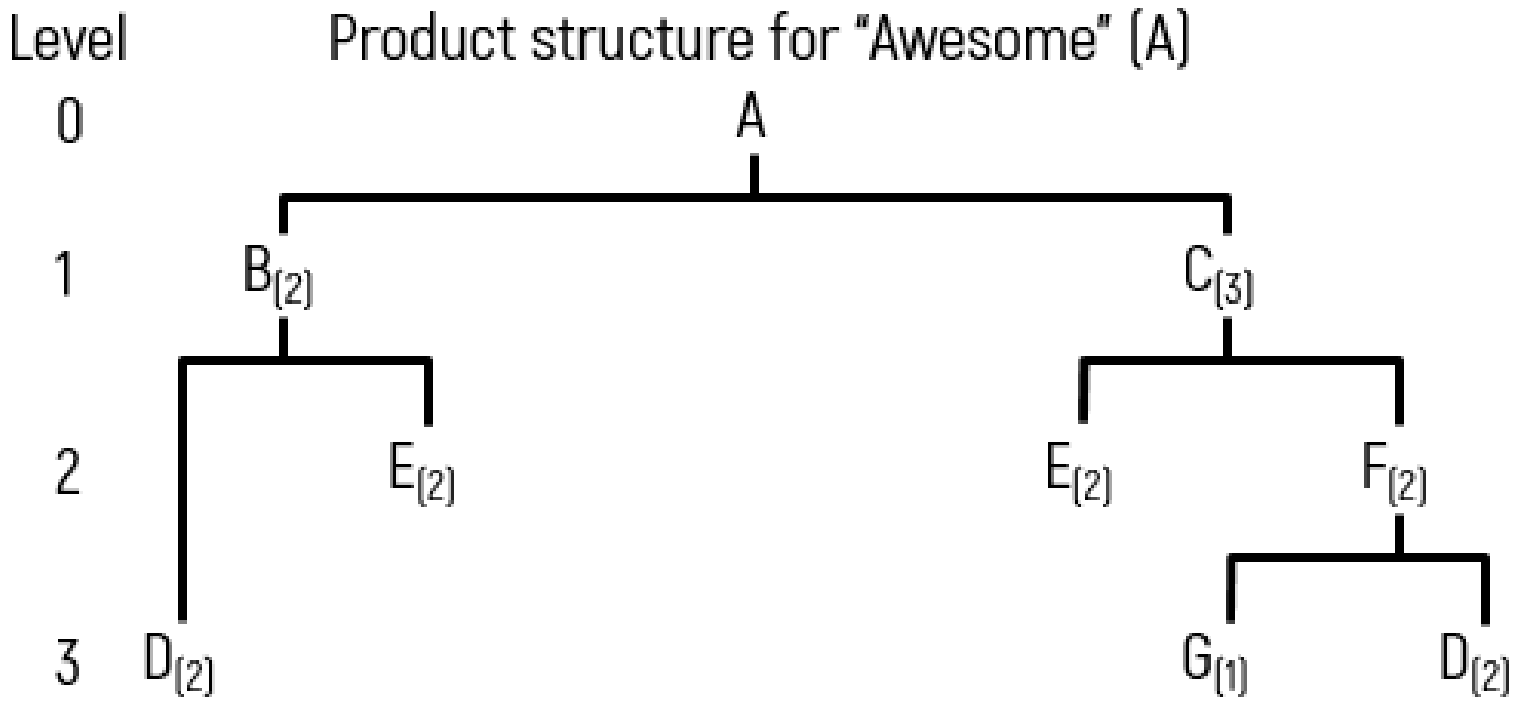
MPS for 3 stereo models that flow from aggregate plan for a family of stereo amplifiers

Source: Heizer & Render (2014)

BOM Example



Source: Heizer & Render (2014)



BOM Example

A = 50 Awesome speaker kits, compute the requirement of each item.

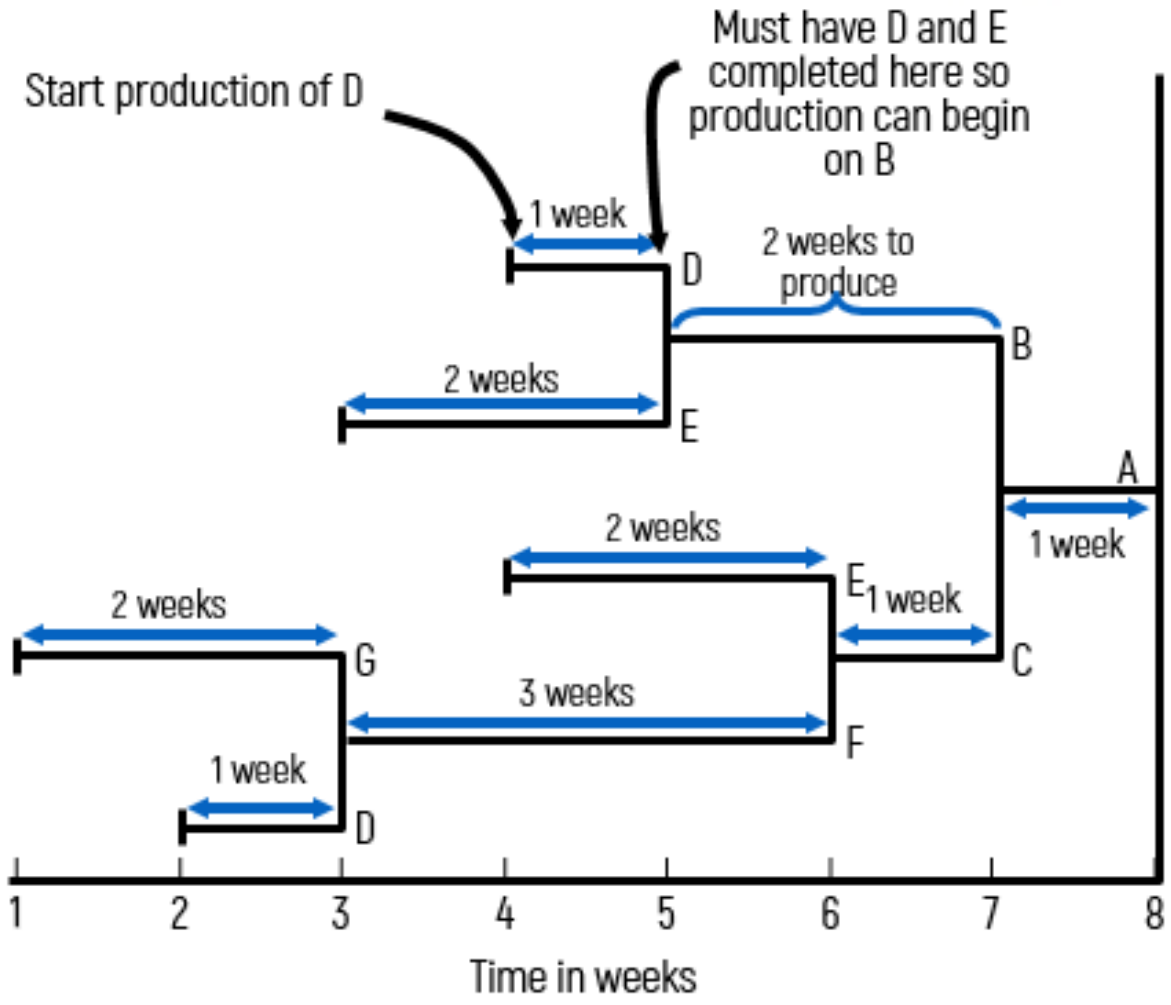
Part B: (2 x As) = (2)(50) = **100**
Part C: (3 x As) = (3)(50) = **150**
Part E: (2 x Bs) + (2 x Cs) = (2)(100) + (2)(150) = **500**
Part F: (2 x Cs) = (2)(150) = **300**
Part D: (2 x Bs) + (2 x Fs) = (2)(100) + (2)(300) = **800**
Part G: (1 x Fs) = (1)(300) = **300**

Source: Heizer & Render (2014)

Time Phase Product Structure

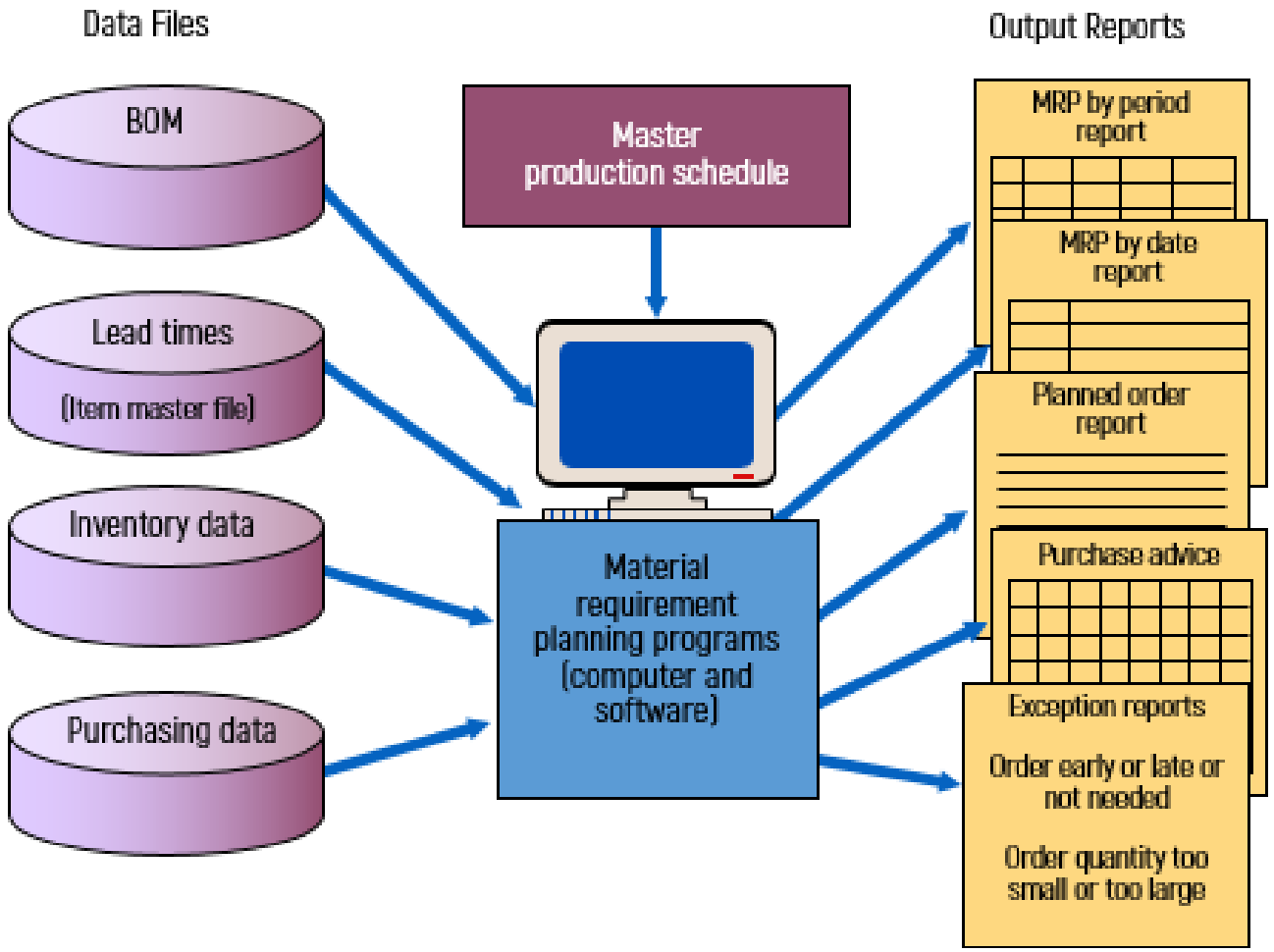
Lead times for Awesome Speaker Kits (A)

Components	Lead Time (week)
A	1
B	2
C	1
D	1
E	2
F	3
G	2



Source: Heizer & Render (2014)

MRP Structure



Source: Heizer & Render (2014)

Determining Gross Material Requirement

Shows total demand for each item (before considering on-hand inventory & scheduled receipt).

Determining Gross Material Requirement

		Week								
		1	2	3	4	5	6	7	8	Lead Time
A.	Required date								50	
	Order release date							50		1 week
B.	Required dates							100		
	Order release date					100				2 weeks
C.	Required date							150		
	Order release date						150			1 week
E.	Required date					200	300			
	Order release date			200	300					2 weeks
F.	Required date						300			
	Order release date			300						3 weeks
D.	Required date			600		200				
	Order release date		600		200					1 week
G.	Required date			300						
	Order release date	300								2 weeks

Source: Heizer & Render (2014)

Net Requirement Plan

Lot Size	Lead Time (weeks)	On Hand	Safety Stock	Allo-cated	Low-Level Code	Item Identi-fication		Week 1	2	3	4	5	6	7	8
Lot-for-Lot	1	10	—	—	0	A	Gross Requirements								50
							Scheduled Receipts								
							Projected On Hand 10	10	10	10	10	10	10	10	10
							Net Requirements								40
							Planned Order Receipts								40
							Planned Order Releases							40	
Lot-for-Lot	2	15	—	—	1	B	Gross Requirements							80[A]	
							Scheduled Receipts								
							Projected On Hand 15	15	15	15	15	15	15	15	
							Net Requirements							65	
							Planned Order Receipts							65	
							Planned Order Releases					65			
Lot-for-Lot	1	20	—	—	1	C	Gross Requirements							120[A]	
							Scheduled Receipts								
							Projected On Hand 20	20	20	20	20	20	20	20	
							Net Requirements							100	
							Planned Order Receipts							100	
							Planned Order Releases						100		

Source: Heizer & Render (2014)

Net Requirement Plan

Lot Size	Lead Time (weeks)	On Hand	Safety Stock	Allo-cated	Low-Level Code	Item Identi-fication		Week 1	2	3	4	5	6	7	8
Lot-for-Lot	2	10	—	—	2	E	Gross Requirements					130[B]	200[C]		
							Scheduled Receipts								
							Projected On Hand 10	10	10	10	10	10			
							Net Requirements					120	200		
							Planned Order Receipts					120	200		
							Planned Order Releases			120	200				
Lot-for-Lot	3	5	—	—	2	F	Gross Requirements						200[C]		
							Scheduled Receipts								
							Projected On Hand 5	5	5	5	5	5	5		
							Net Requirements						195		
							Planned Order Receipts						195		
							Planned Order Releases			195					

Source: Heizer & Render (2014)

Net Requirement Plan

Lot Size	Lead Time (weeks)	On Hand	Safety Stock	Allo-cated	Low-Level Code	Item Identi-fication		Week 1	2	3	4	5	6	7	8
Lot-for-Lot	1	10	—	—	3	D	Gross Requirements			390[F]		130[B]			
							Scheduled Receipts								
							Projected On Hand 10	10	10	10					
							Net Requirements			380		130			
							Planned Order Receipts			380		130			
							Planned Order Releases		380		130				
Lot-for-Lot	2	0	—	—	3	G	Gross Requirements			195[F]					
							Scheduled Receipts								
							Projected On Hand			0					
							Net Requirements			195					
							Planned Order Receipts			195					
							Planned Order Releases	195							

Source: Heizer & Render (2014)

Safety Stock

Level of **stock** maintained to mitigate risk of shortages due to uncertainties in supply & demand.

- ✓ Information (such as inventory level, production volume, etc.) may not be accurate. Thus, safety may be required.
- ✓ It must be minimized & eliminated.

References

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