TOWARD PRODUCTION: PROTOTYPE AND FULL-SCALE

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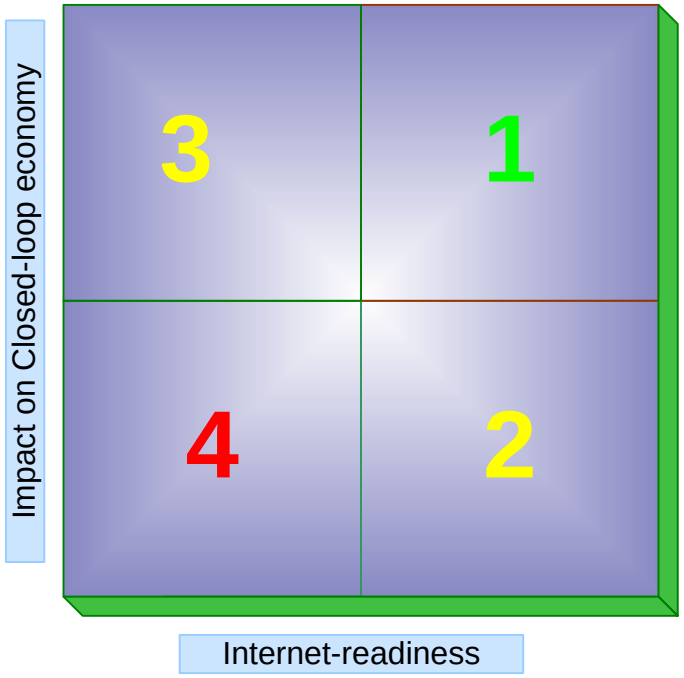
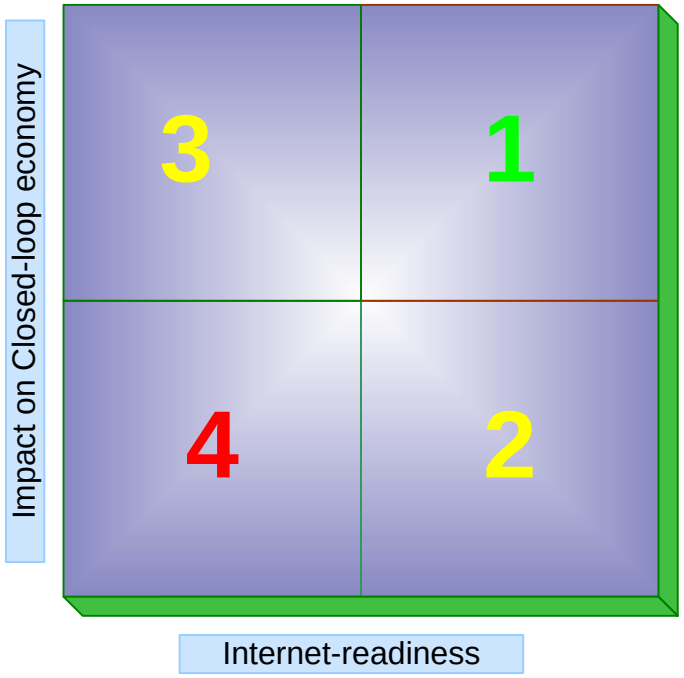
Product development process

Good design

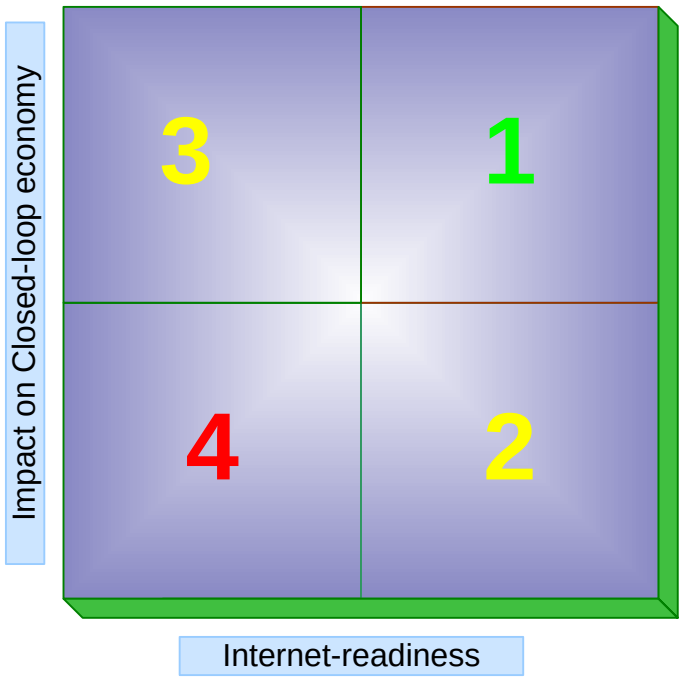


Good design



Design satisfies requirements. Will the final product be good enough?

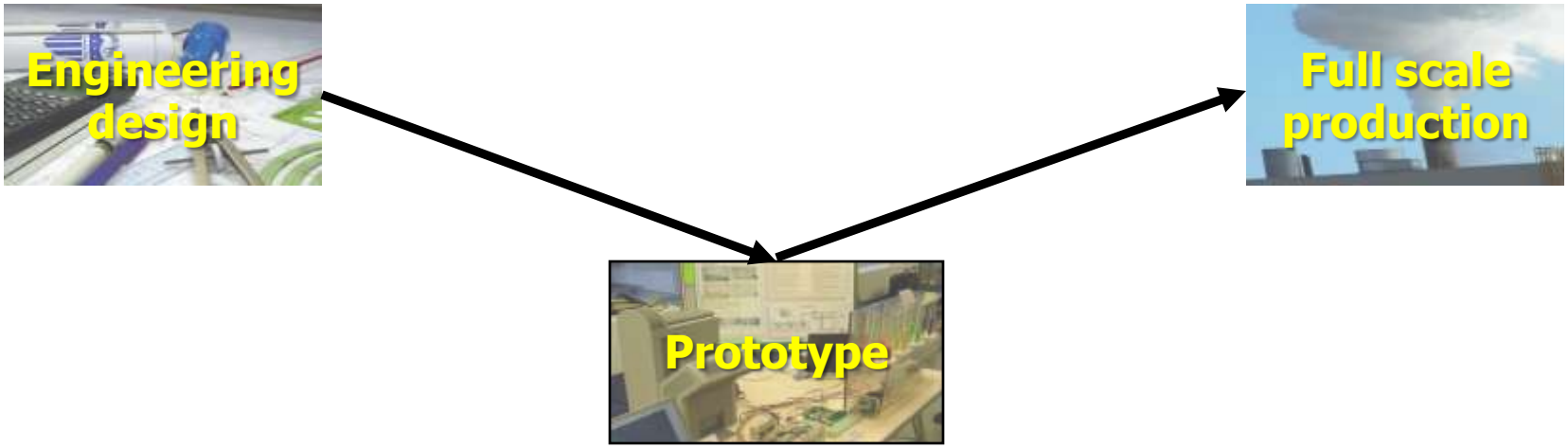
Good design



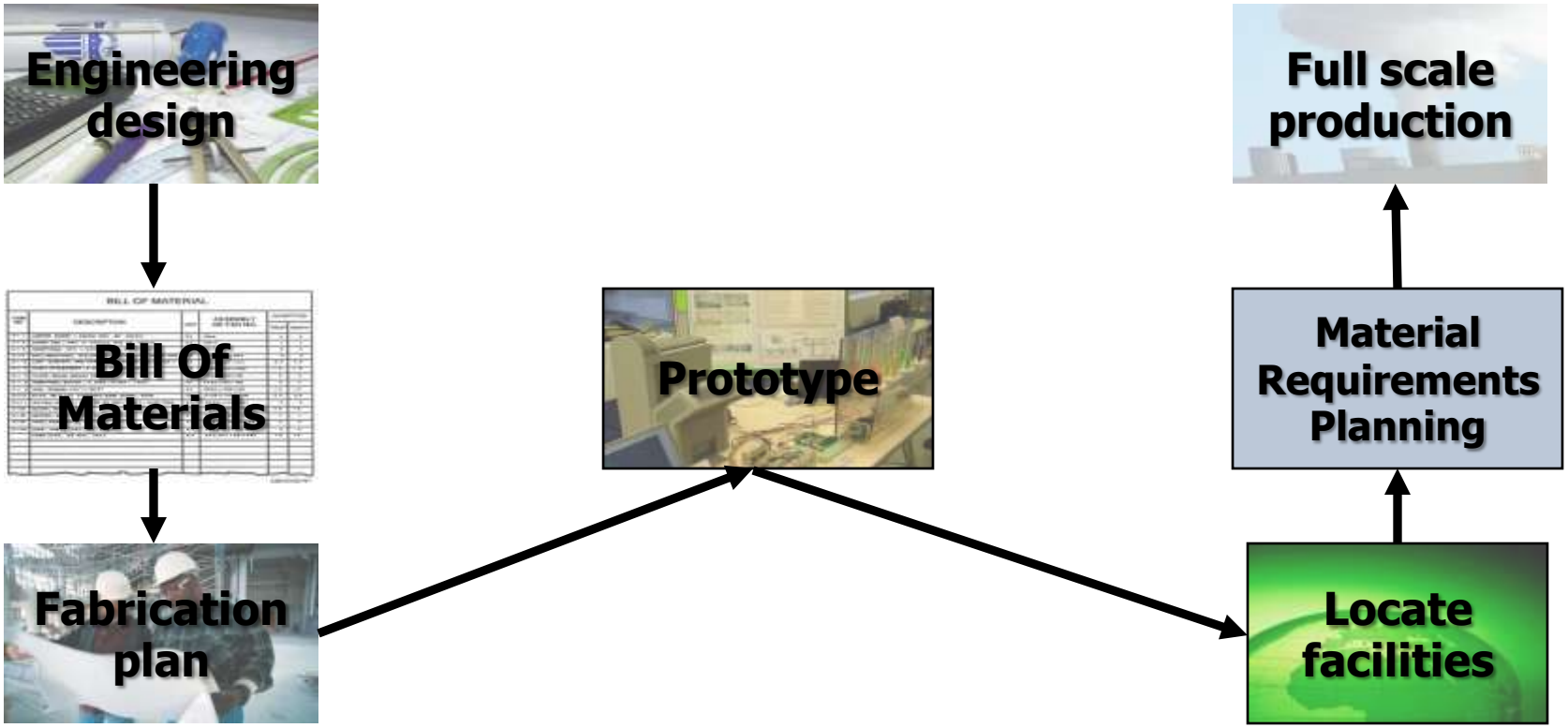
- Final success also depends on
  - Materials selected
  - Manufacturing practices
  - Distribution practices
  - …

Steps forward

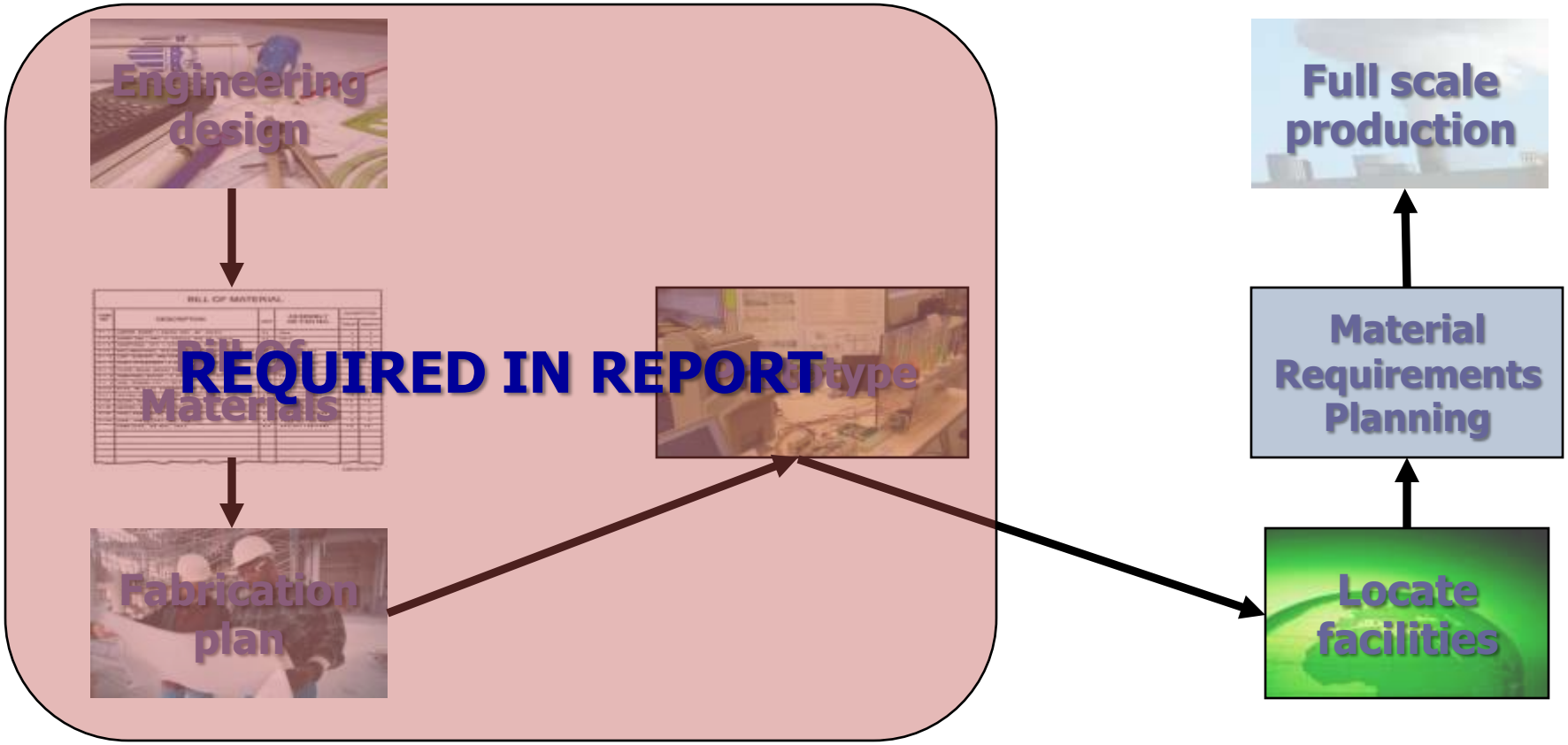
Steps forward



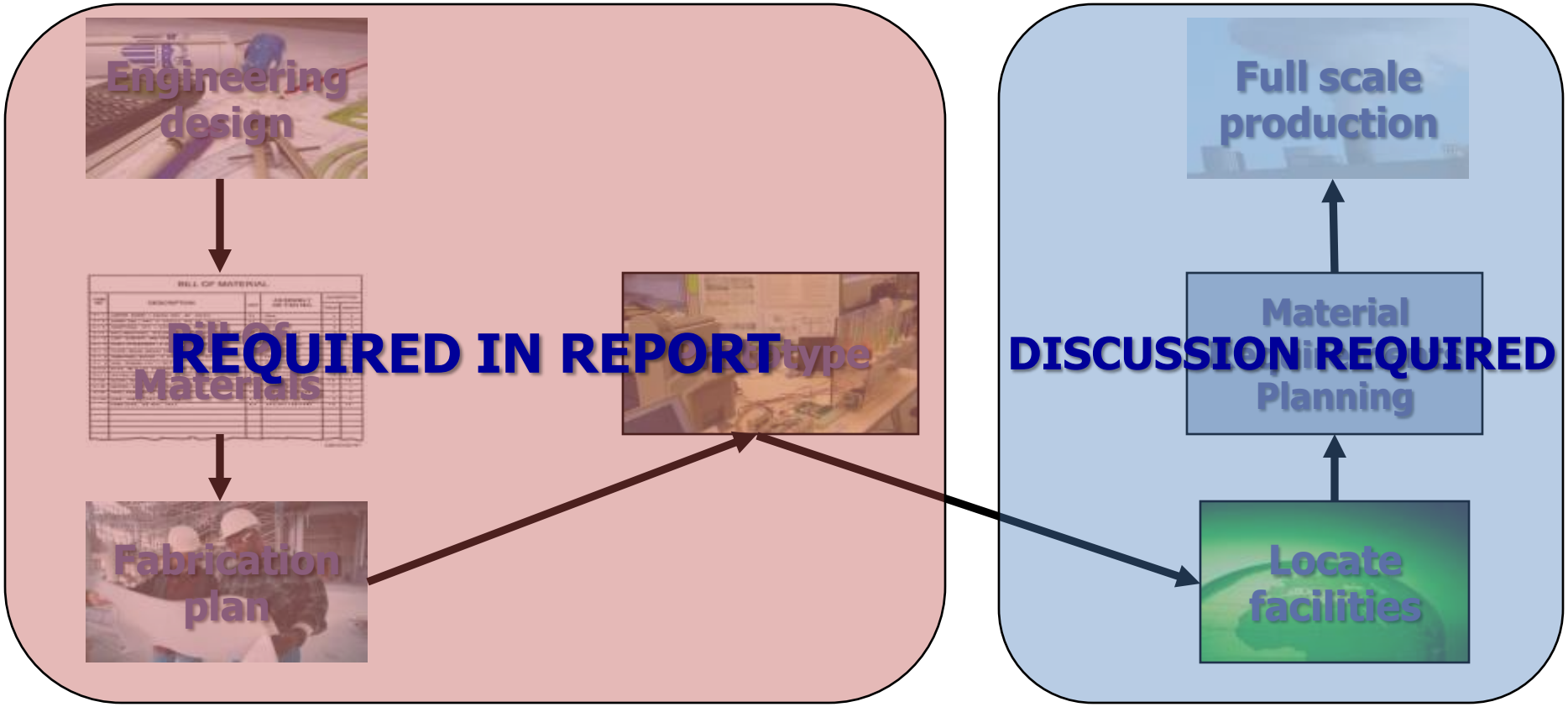
Steps forward



Steps forward



Steps forward



Steps forward

Bill Of Materials (BOM)

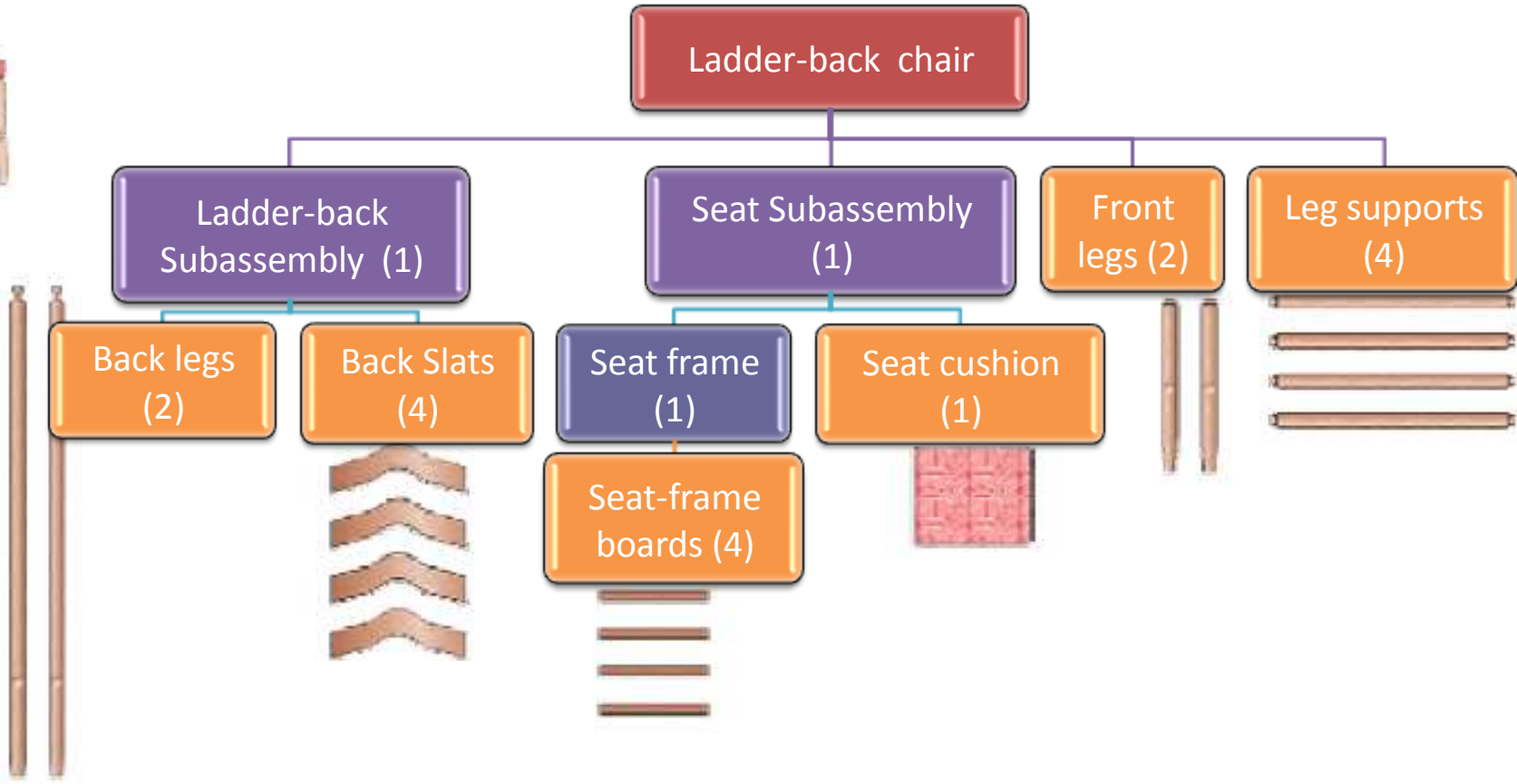
A structured list of the materials, parts, assemblies and their respective quantities that define a product.

Example

Ladder-back chair

BOM:
Subassemblies and components

Ladder-back chair



Bill Of Materials

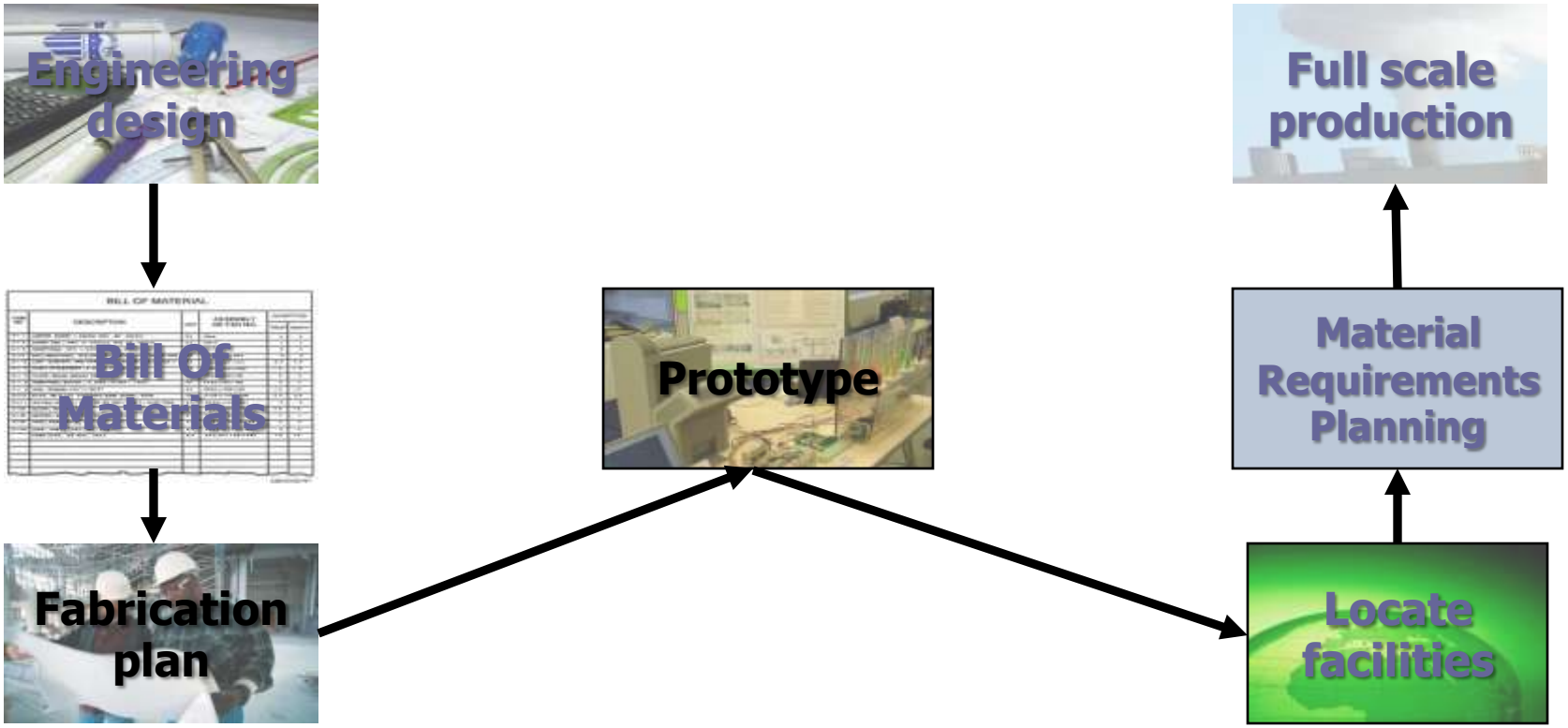

Ladder-back chair

Item No	Sub-assembly	Intermediate	Purchase Items	Units	Cost ($)	Source
1	Seat subassembly (1)	Seat frame (1)	Seat frame boards	4	0.55	USA
			Seat cushion	1	1.56	India
2	Ladder-back subassembly (1)		Back legs	2	0.45	China
			Back slats	4	0.35	China
3			Front legs	2	1.10	USA
4			Leg supports	4	0.35	USA

BOM in your project

- Develop BOM
  - determine components
  - determine subassemblies

Steps forward



Prototype?

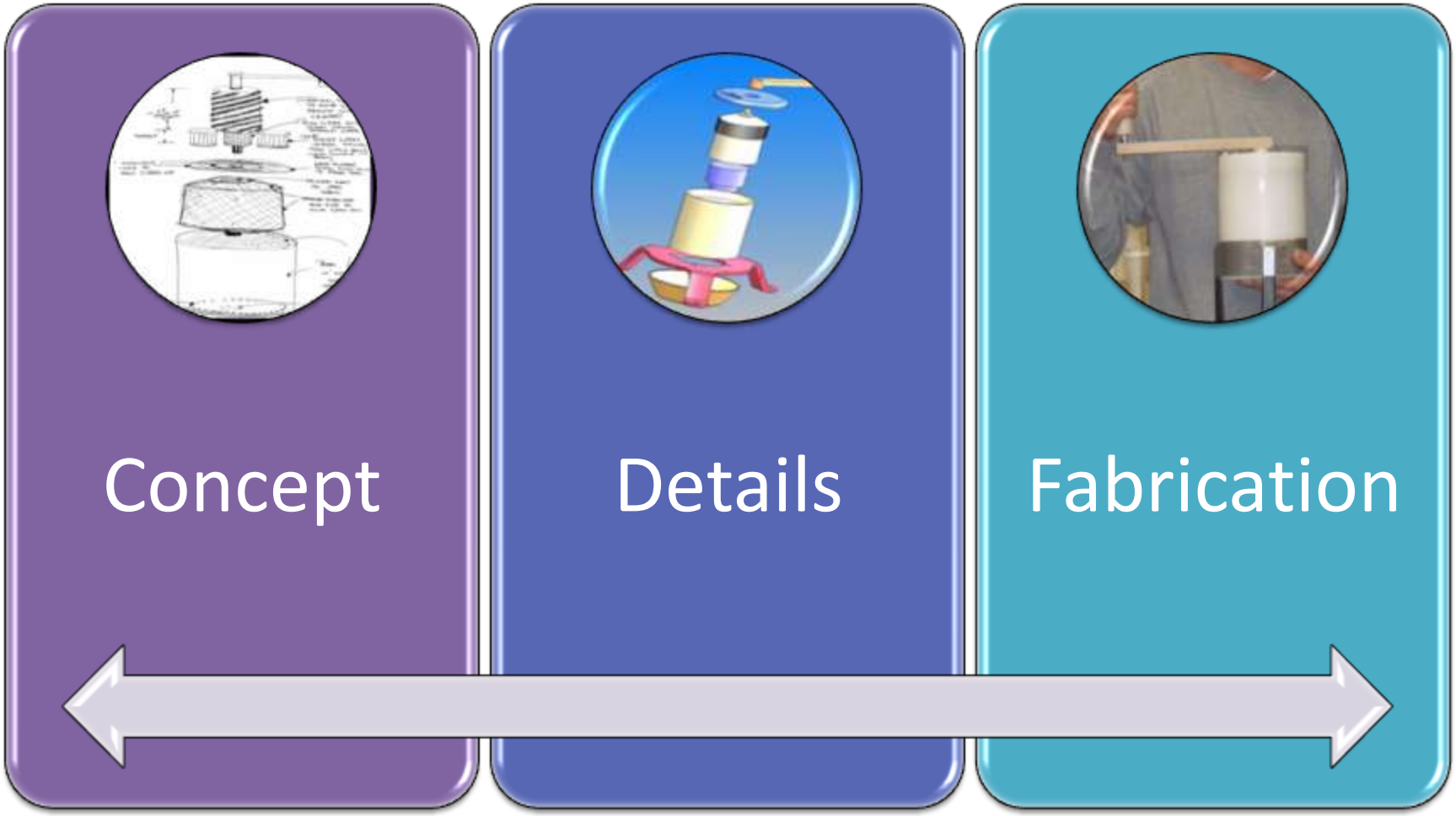
When?

Why?

What?

How?

Prototyping (When?)



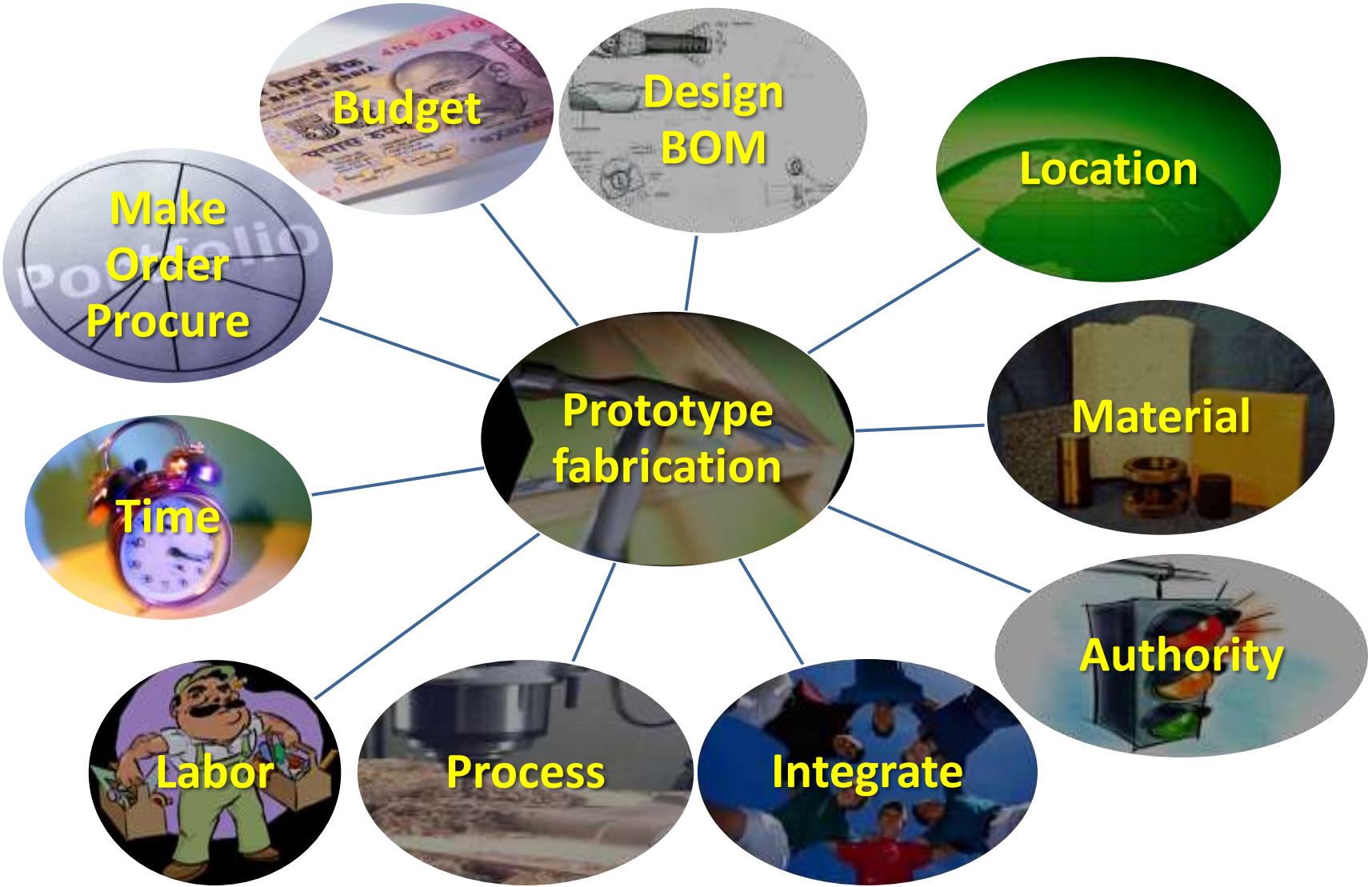
Prototyping (Why?)

Prototyping (What?)

Prototype vs Final design

How and why is your prototype different from the final product?

Prototyping (How?)



Prototyping (Budget?)

200 dollars

Per site

For local expenditure

Operation sheet

DARVIC INDUSTRIES

OPERATION SHEET

PART NAME: Threaded Shaft 1340 Cold Rolled Steel

Part No. 7358-267-10

OPER. NO.	NAME OF OPERATION	MACH. TOOL	CUTTING TOOL	CUTTING SPEED ft/min	CUTTING SPEED rpm	FEED ipr	DEPTH OF CUT inches	REMARKS
10	Face end of bar	Engine Lathe		120	458	Hand		Use 3-jaw Universal chuck
20	Center Drill End	"	Combination center drill		750	Hand		
30	Cut off to $3\frac{9}{16}$ length	"	Parting tool	120	458	Hand		To prevent chattering, keep overhang of work and tool at a minimum and feed steadily. Use lubricant.
40	Face to length	"	RH facing tool (small radius point)	120	458	Hand	(R) $\frac{1}{8}$ max. (F) .005	Before replacing part in 3-jaw chuck, scribe a line marking the $3\frac{1}{4}$ inch length.
50	Center Drill End	"	Combination center drill		750	Hand		
60	Place between centers, turn $\frac{.501}{.499}$ diameter, and face shoulder	"	RH turning tool (small radius point)	120 160	(R) 458 (F) 611	(R) .0089 (F) .0029	(R) .081 (3) (F) .007	
70	Remove and replace end for end and turn $\frac{.877}{.873}$ diameter	"	RH tools (R) (small radius point) (F) Round nose tool	120 160	(R) 458 (F) 611	(R) .0089 (F) .0029	(R) .057 (F) .005	
80	Produce 45°-chamfer	"	RH round nose tool	120	458	Hand	(R) $\frac{1}{8}$ max. (F) .005	
90	Cut $\frac{7}{8}$ - 14 NF-2 thread	"	Threading tool	60	208		(R) .004 (F) .001	(1) Swivel compound rest to 30 degrees. (2) Set tool with thread gage. (3) When tool touches outside diamter of work set cross slide to zero. (4) Depth of cut for roughing = .004. (5) Engage thread dial indicator on any line. (6) Depth of cut for finishing = .001 Use compound rest.
	Remove burrs and sharp edges	"	Hand file					

Date

Operation sheet

DARVIC INDUSTRIES

OPERATION SHEET

PART NAME: Threaded Shaft 1340 Cold Rolled Steel — Part No. 7358-267-10

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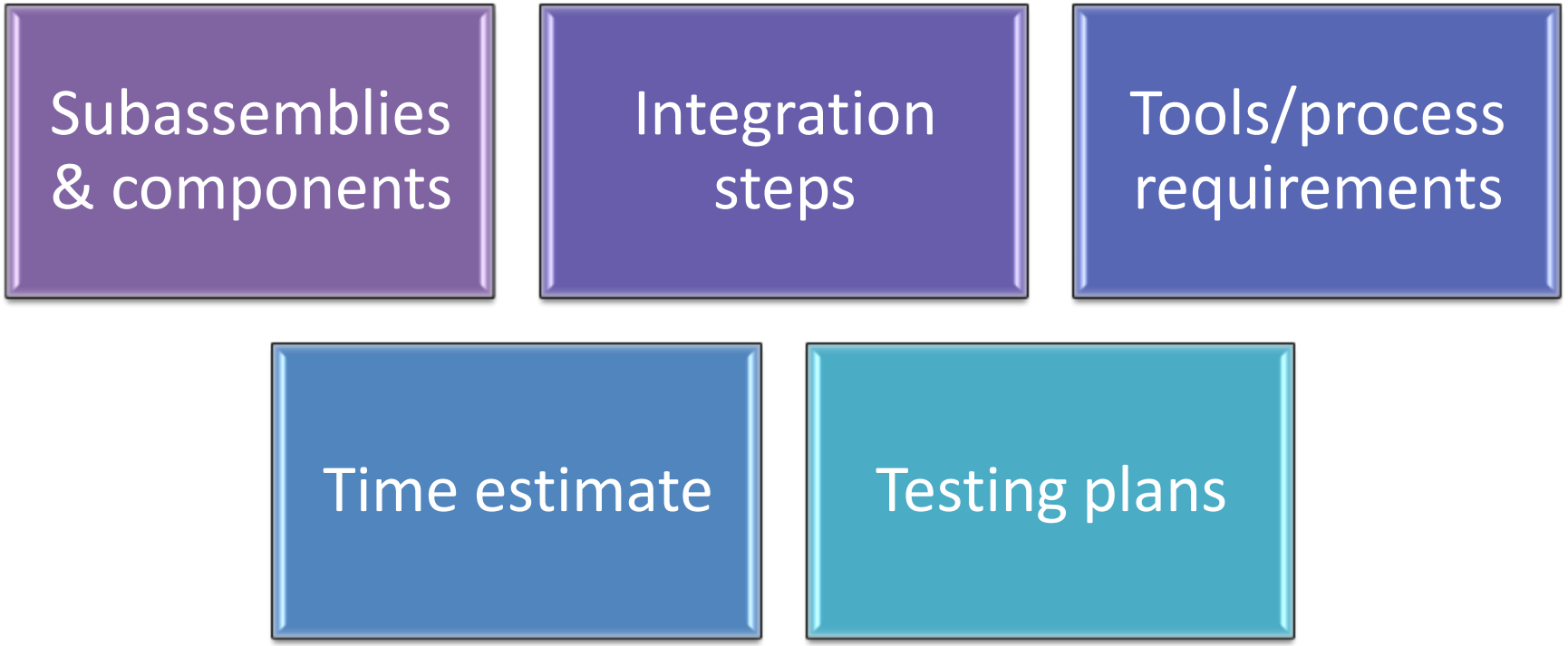
40	Face to length	"	RH facing tool (small radius point)	120	458	Hand	(R) $\frac{1}{8}$ max. (F) .005	Before replacing part in 3-jaw chuck, scribe a line marking the $3\frac{1}{4}$ inch length.
50	Center Drill End	"	Combination center drill		750	Hand		
60	Plain b[illegible] ers, [illegible] .01 [illegible] .99 [illegible] er, [illegible] shoulder	"	[illegible] ng tool (sm[illegible] du[illegible] point)	120 160	(R) 458 (F) 611	(R) [illegible] (F) [illegible]	(R) [illegible] (F) [illegible]	
70	Remove and replace end for end and turn .877 .873 diameter	"	RH tools (R) (small radius point) (F) Round nose tool	120 160	(R) 458 (F) 611	(R) .0089 (F) .0029	(R) .057 (F) .005	
80	Produce 45°-chamfer	"	RH round nose tool	120	458	Hand	(R) $\frac{1}{8}$ max. (F) .005	
90	Cut $\frac{7}{8}$ - 14 NF-2 thread	"	Threading tool	60	208		(R) .004 (F) .001	(1) Swivel compound rest to 30 degrees. (2) Set tool with thread gage. (3) When tool touches outside diamter of work set cross slide to zero. (4) Depth of cut for roughing = .004. (5) Engage thread dial indicator on any line. (6) Depth of cut for finishing = .001 Use compound rest.
	Remove burrs and sharp edges	"	Hand file					

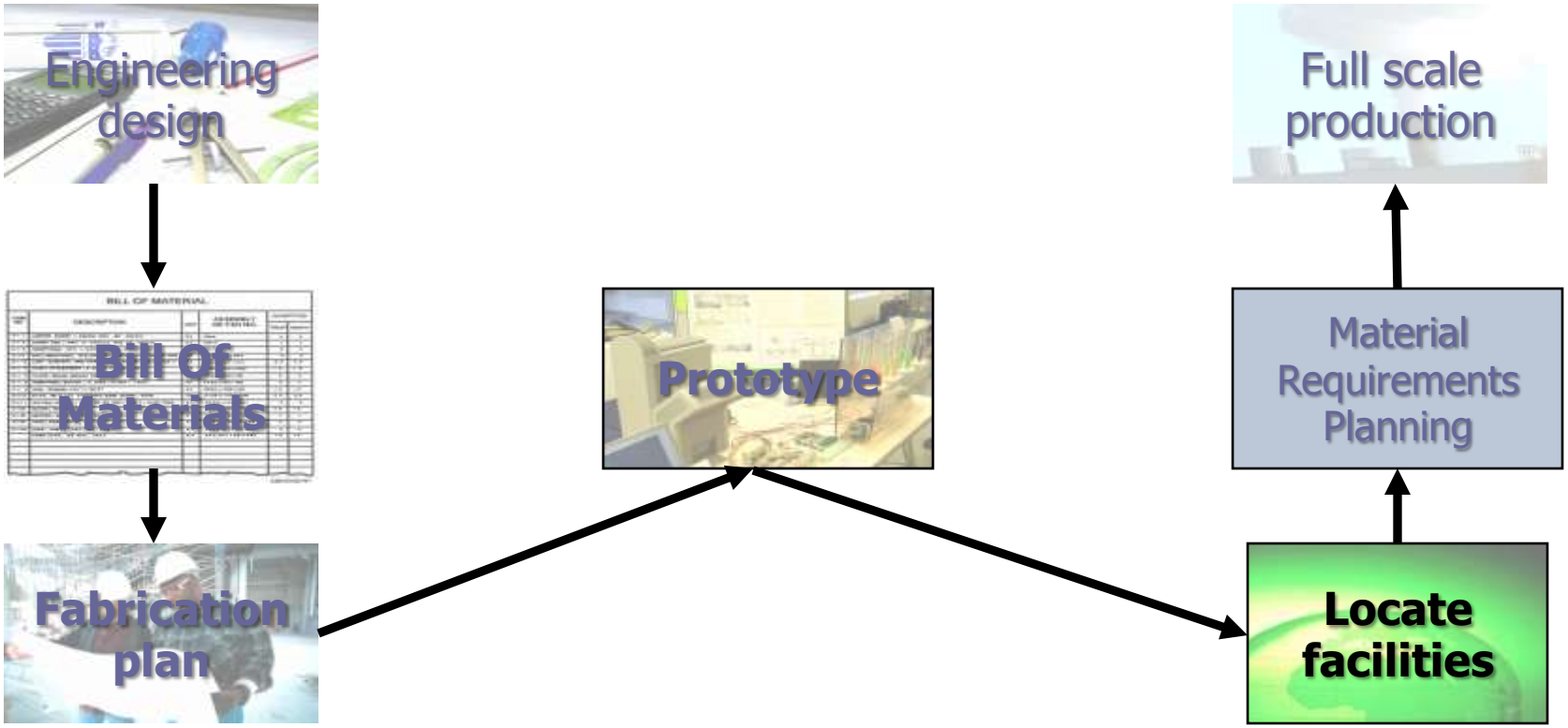
Date

NOT REQUIRED IN REPORT

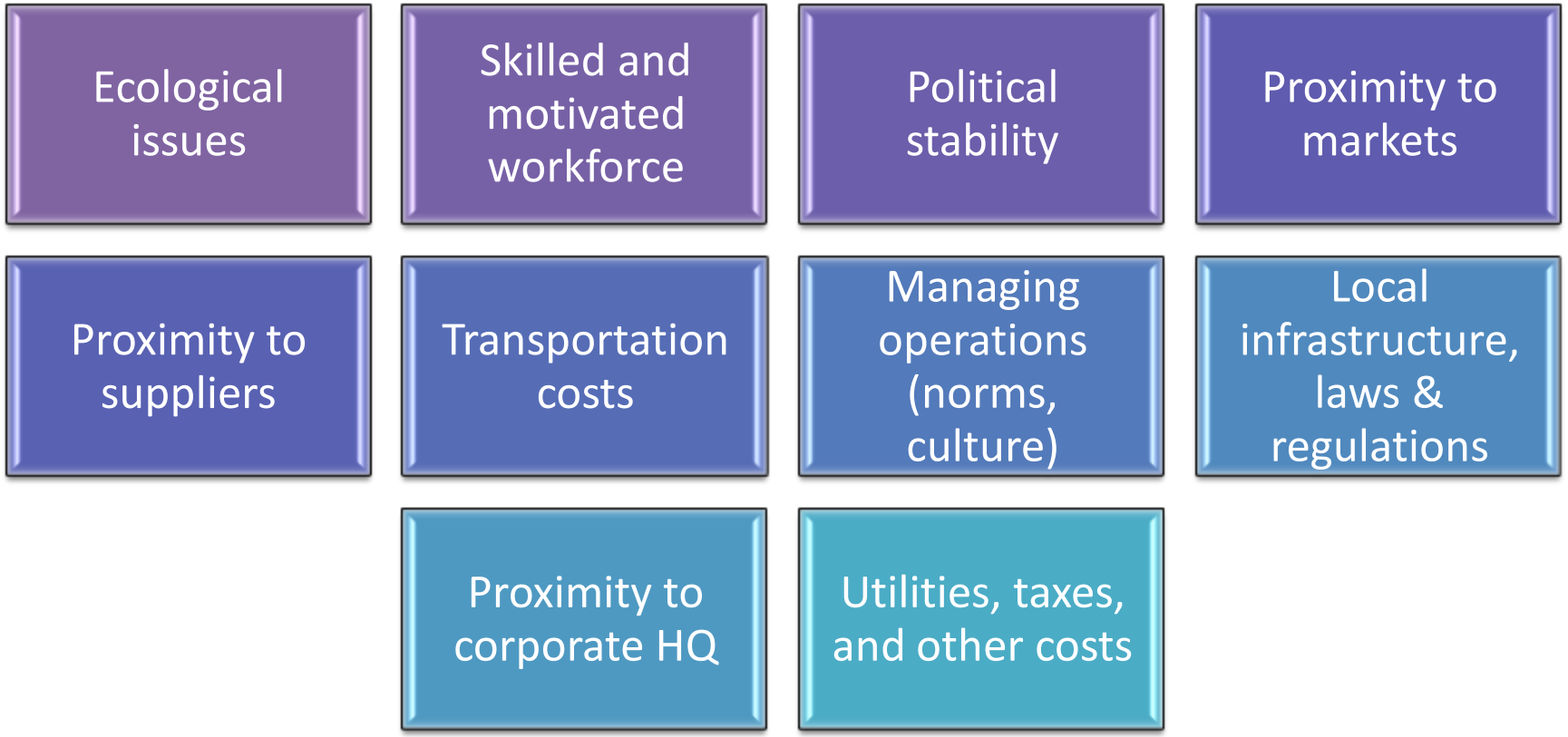
System Integration plans



Steps forward



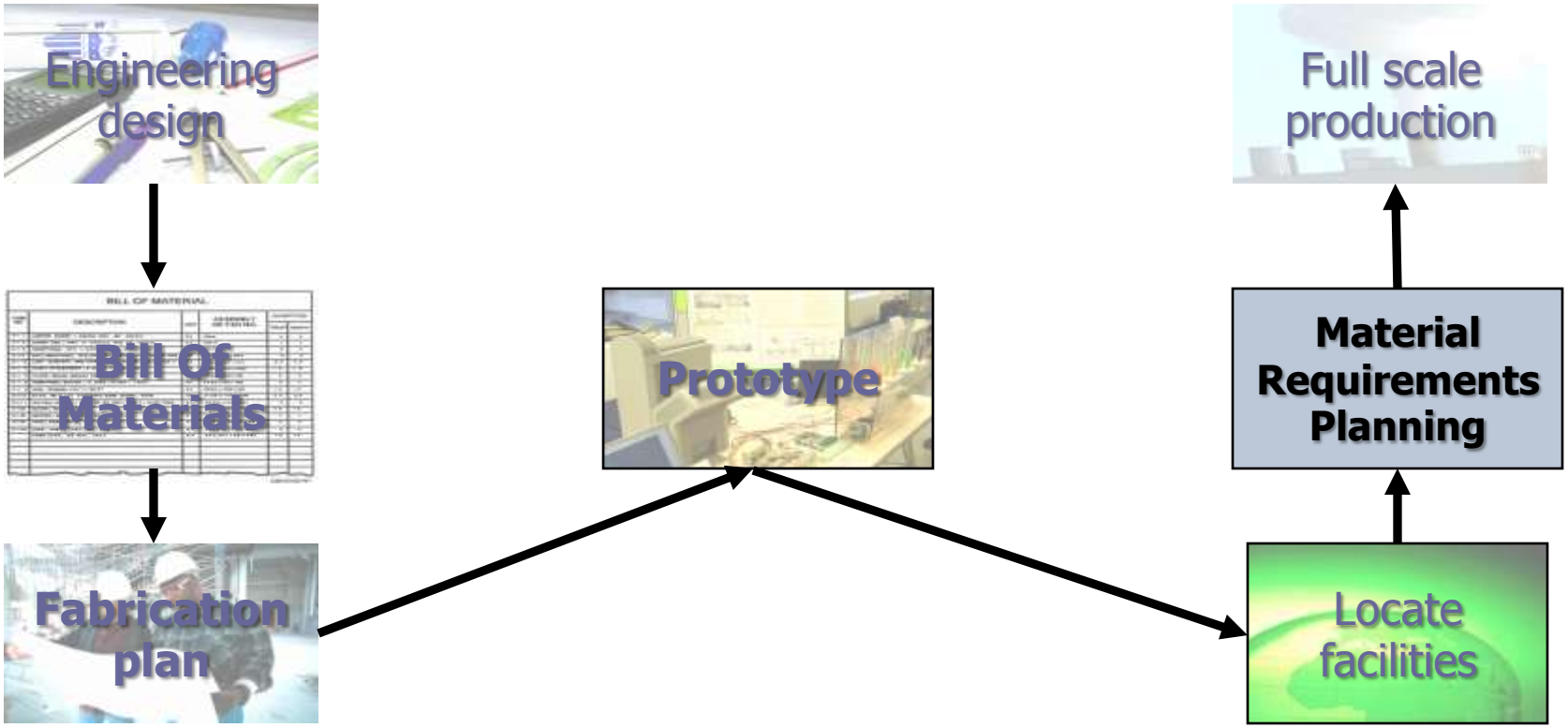
Locate manufacturing facilities globally



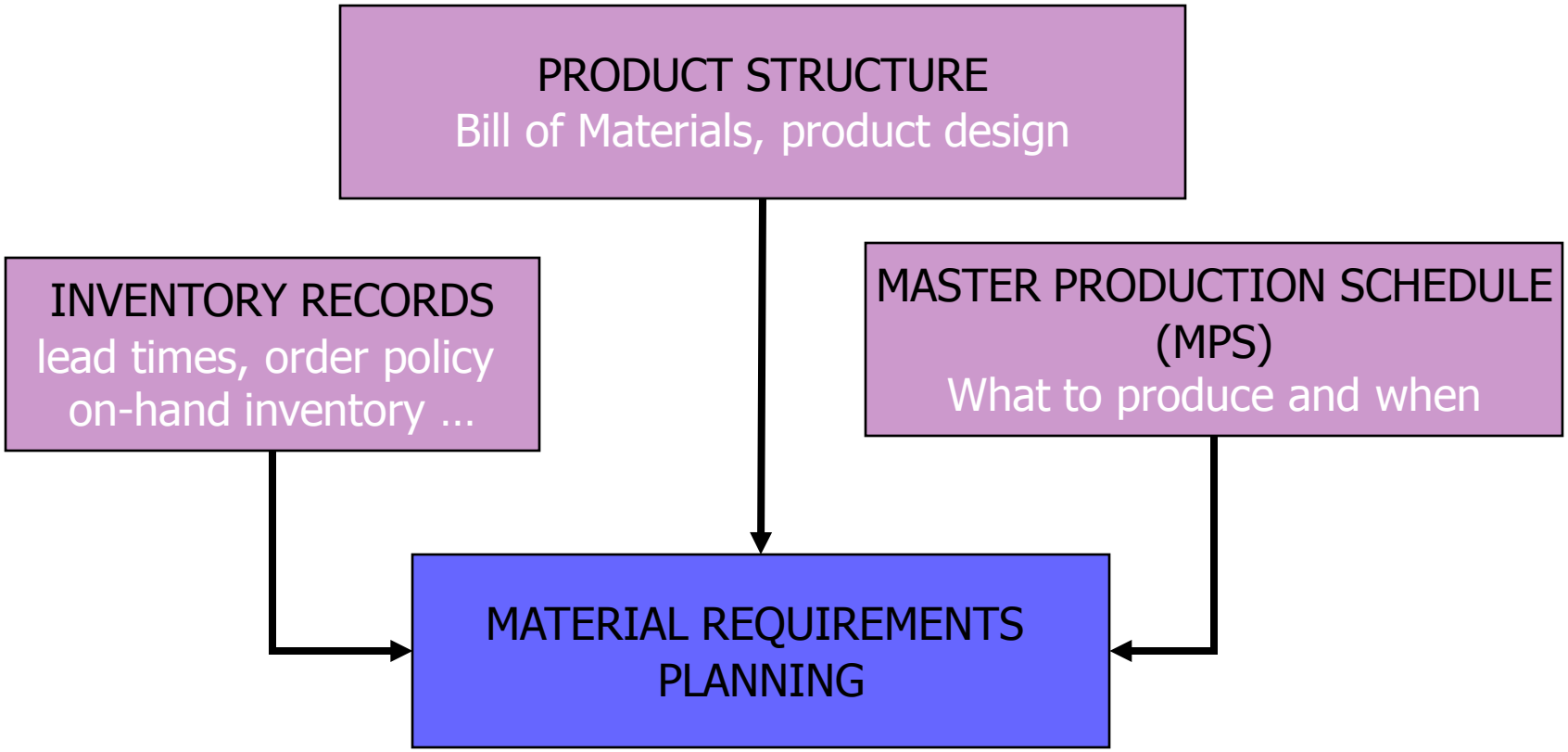
In your final report

- Identify manufacturing processes
- Identify manufacturing location(s)
- Provide rationale
- State advantages
- State areas of concern (if any)

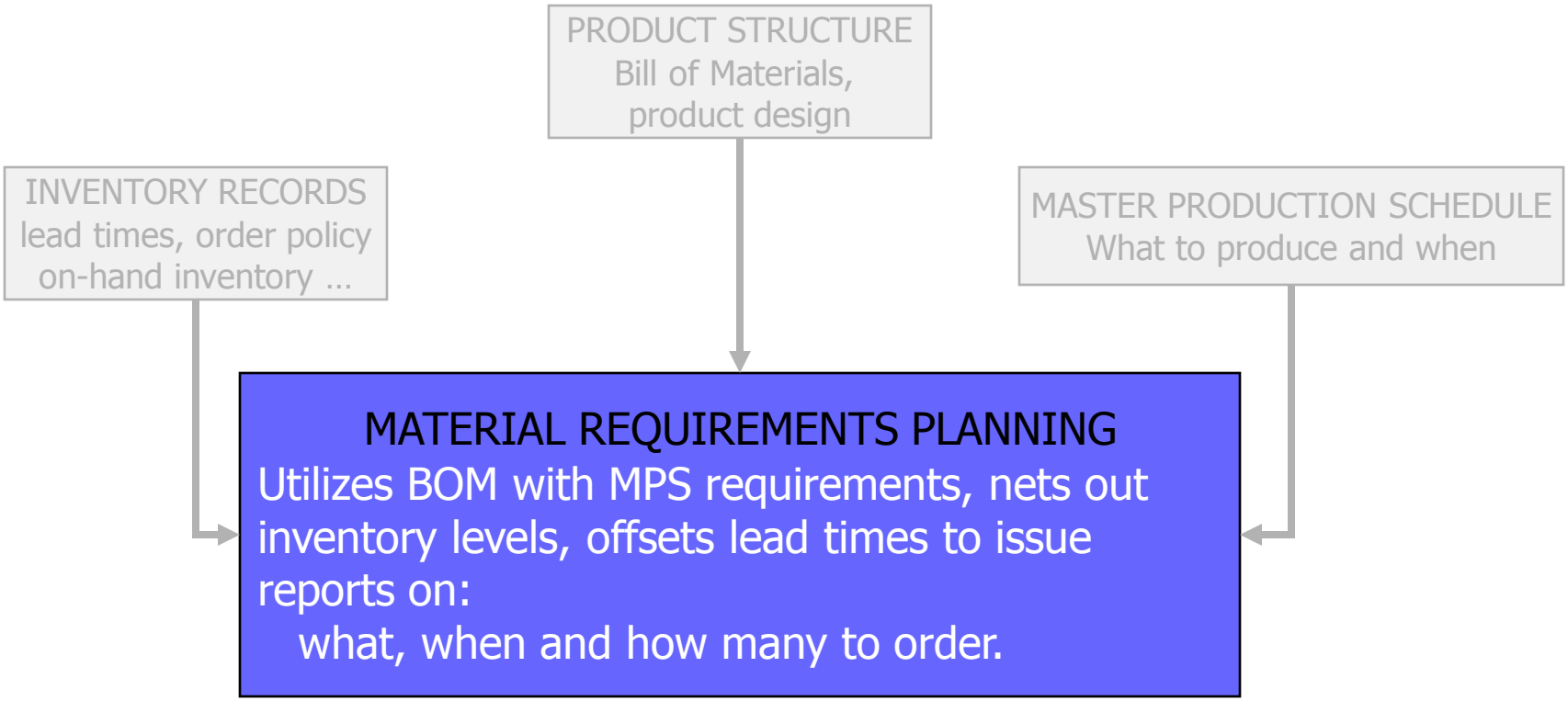
Steps forward



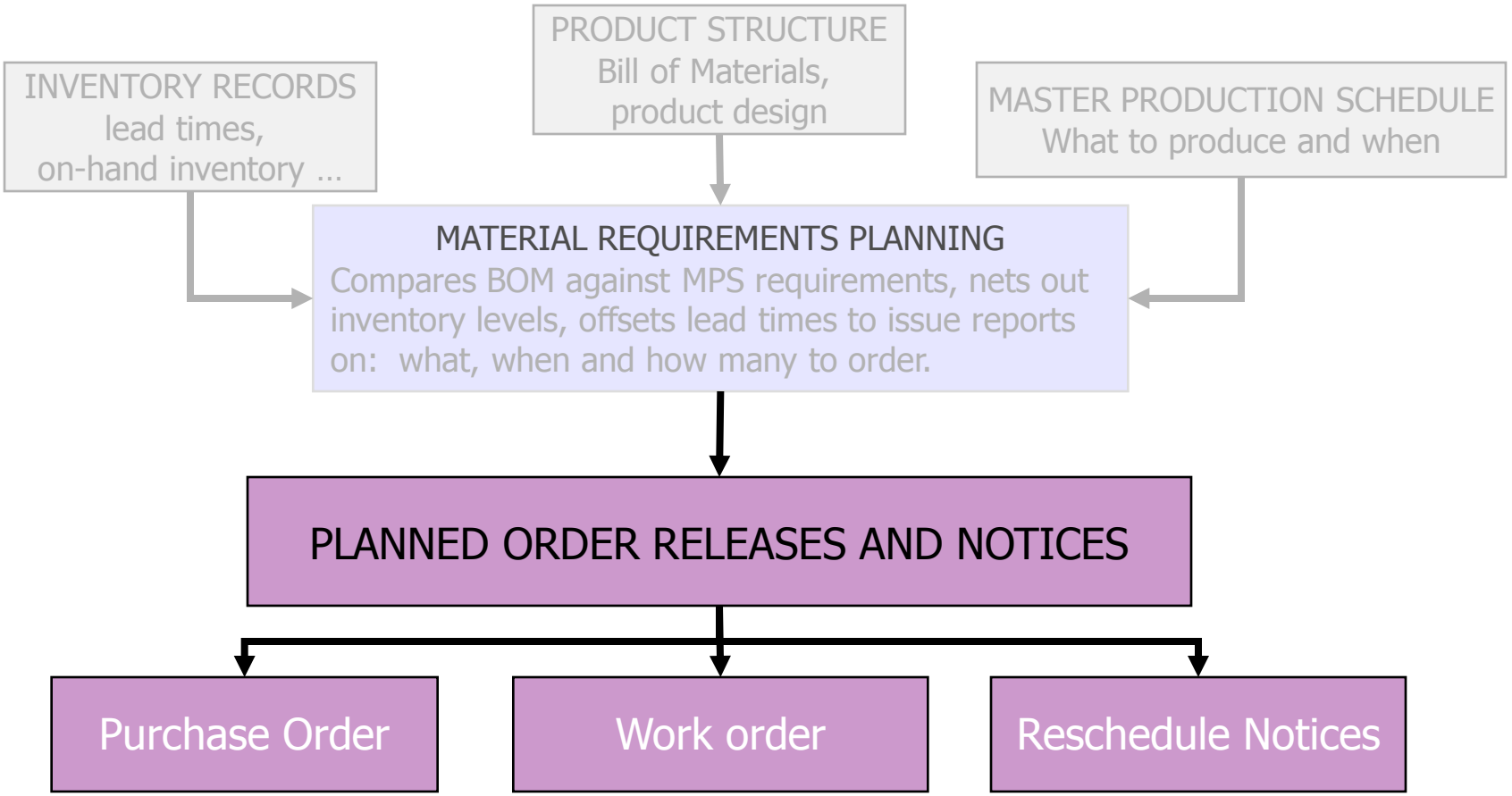
Inputs to MRP



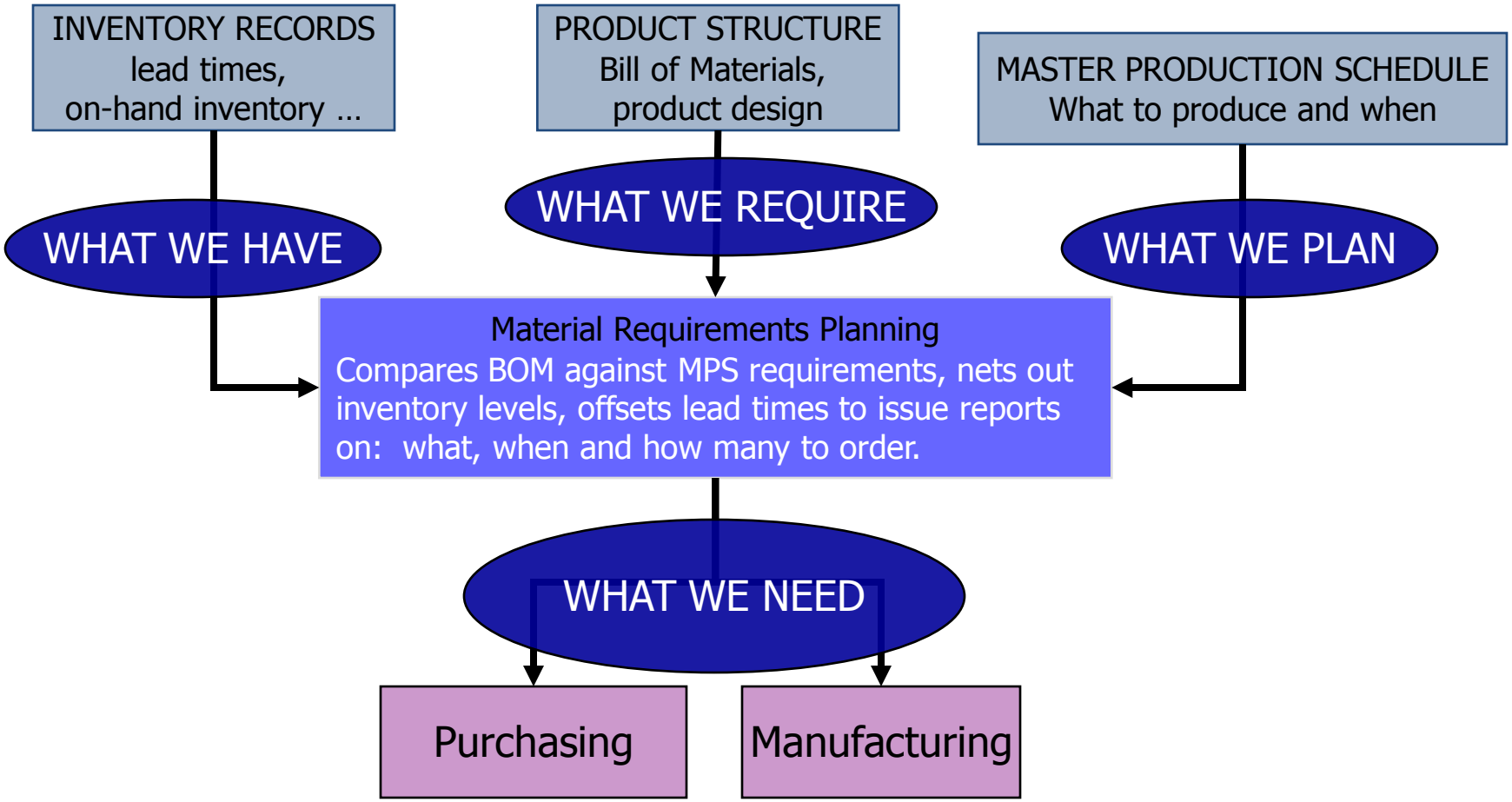
Material requirements planning (MRP)



MRP Outputs

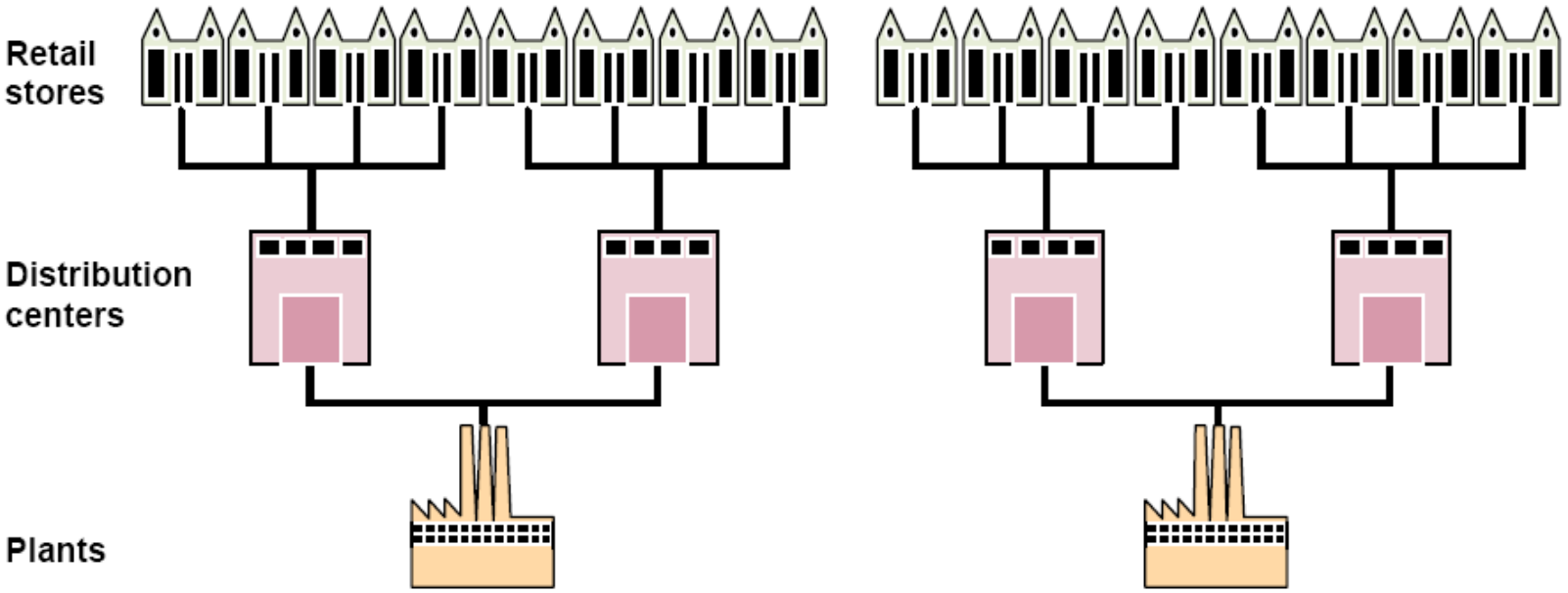

INVENTORY RECORDS
lead times,
on-hand inventory …
PRODUCT STRUCTURE
Bill of Materials,
product design
MASTER PRODUCTION SCHEDULE
What to produce and when
MATERIAL REQUIREMENTS PLANNING
Compares BOM against MPS requirements, nets out inventory levels, offsets lead times to issue reports on: what, when and how many to order.
PLANNED ORDER RELEASES AND NOTICES
Purchase Order
Work order
Reschedule Notices

Material Requirements Planning



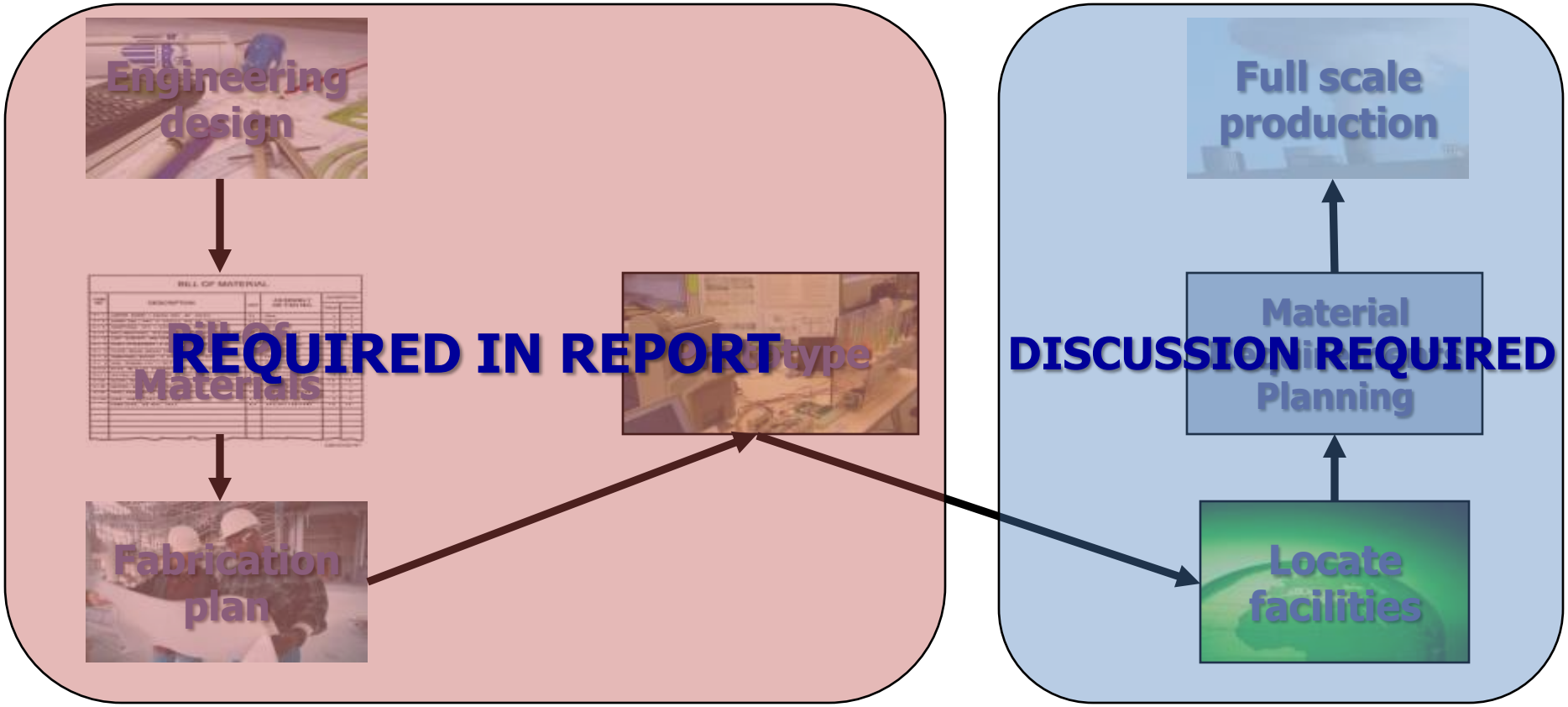
Distribution requirements planning

Some project groups also have to consider this



From: Krajewski & Ritzman, "Operations Management" 6th Edition, Prentice Hall

Steps forward



Question time