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Bill of Materials

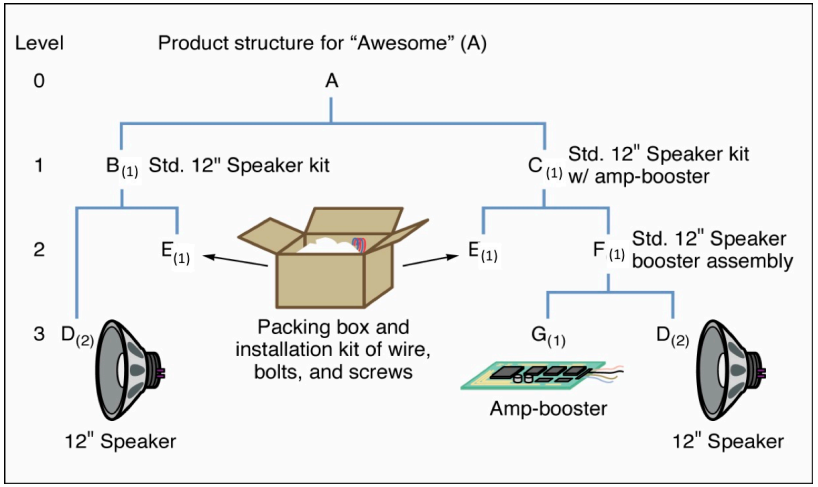
Bill of Materials

The **Bill of Materials (BOM)** file contains

- the complete product description, listing the materials, parts and components
- the quantity of each item
- the sequence in which the product is created

Each item and component is listed showing only its parents and the number of units needed per unit of its parents, with the parent-child links

Example of Bill of Materials



Design and Production Bill of Materials

Design BoM

It is drawn up by the technical area in the design phase. It contains information relating to the design aspects (It refers to drawings and technical documents)

Production BoM

It is drawn up on that of design by Production Engineering. It translates the technical codes into those used in the production area with addition of other management information

DESIGN BILL OF MATERIALS

PRODUCTION BILL OF MATERIALS

→ COMBINED BILL OF MATERIALS

It resolves the following problems:

- avoid duplication when manufacturing and design provide different information
- it manages the supply and production lead time by integrating management and technical needs

Design Bill of Materials

"They are structures with logical links, which represent both a valid support to simplify the planning operations, and a possible tool for integration between the different phases of production planning"

Brandolese – Pozzetti – Sianesi

Family Bill

The many variations of a product can make it very difficult keep a separate list for each combination.

Case A) - Limited number of variants

In the order explosion phase, the variants are encoded in the structure records.

Case B) - High number of variants

Organization of the bill of materials "by variants"
It means defining a basic version and managing customized items with separate bills. Each product is the aggregation of the two bills.

BoM for product variants

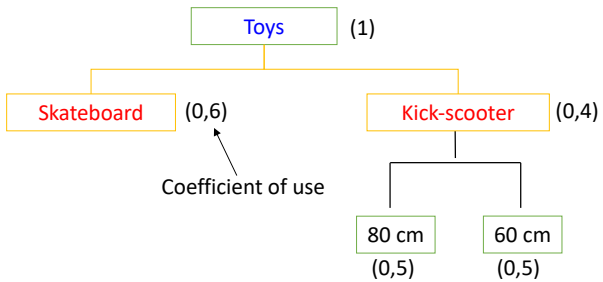
Bill with a tree structure that highlights the parent-child links existing between the different levels of product aggregation.

Example

Lo – Type or Group

L1 – Family

L2 – Item or Code



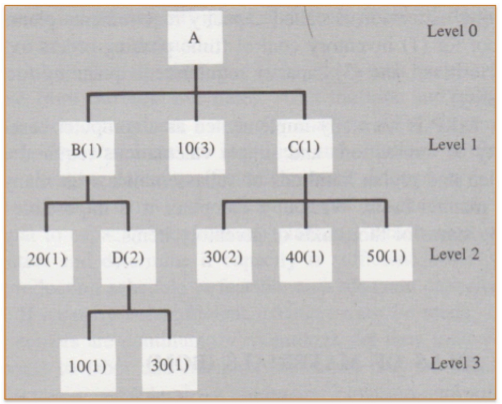
Traditional BOM

It develops in different forms according to the purpose for which it aims

a. **Simple list of components**
b. **Structure indicating how a product is made**
c. **Structure created to allow components consumption forecasting and drafting of the main production plan (MPS o MS)**

The product structure can generate different report formats to meet different business needs.

Example - 4-level structure

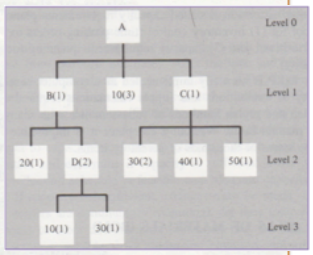


- Letters indicate sub-assemblies: B-C-D
- Numbers indicate the components: 10-20-30-40-50
- Brackets the quantities needed

Example

Single-level explosion BOM for assemblies *A*, *B*, *C*, and *D*

Assembly	*Component part number*	*Quantity per assembly*	*Description*
A	*B*	1	
	C	1	
	10	3	
B	*D*	2	
	20	1	
C	30	2	
	40	1	
	50	1	
D	10	1	
	30	1	

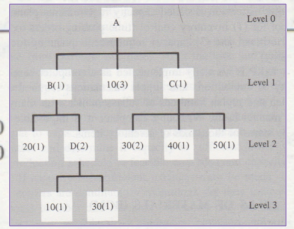


The structure is described by means of 4 single-level BOMs

Example

Indented explosion BOM for product *A*

Part number			*Quantity per assembly*	*Unit of measure*
Level 1	2	3		
B			1	
·	20		1	
·	*D*		2	
·	·	10	1	
·	·	30	1	
C			1	
·	30		2	
·	40		1	
·	50		1	
10			3	



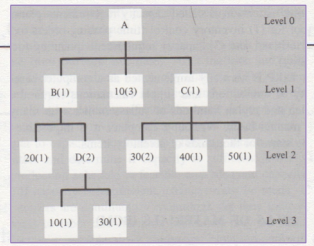
It represents the product as it is made

Example

Summary explosion BOM for product *A*

Assembly	*Component*[a]	*Quantity required*	*Unit of Measure*
A	10	5	
	20	1	
	30	4	
	40	1	
	50	1	
	(B)	(1)	
	(C)	(1)	
	(D)	(2)	

[a]Subassemblies are indicated by parentheses. This listing of subassemblies is optional.

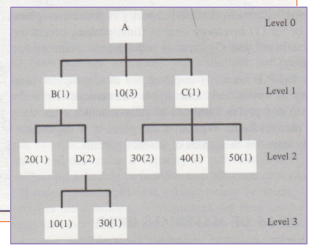


- Lists the "object" that make up the product and their quantities without indicating the level of the structure, the sequence of use and the "parent" level
- It is fundamental in the **purchasing** management phase
- Very useful if a single component is also used for **other products**

Example

Single-level implosion BOM for components 10, 20, 30, 40, and 50

Component part number	*Assembly used on*	*Quantity per assembly*	*Description*
10	*A*	3	
	D	1	
20	*B*	1	
30	*C*	2	
	D	1	
40	*C*	1	
50	*C*	1	



The format indicates the sub-assemblies that use a given component and the related quantities needed

Matrix BOM

Matrix BOM for products *A*, *X*, and *Z*

Component part number	*Description*	*Unit of measure*	*Product*		
			A	*X*	*Z*
10			5	5	2
20			1	2	X
30			4	7	2
40			1	1	X
50			1	1	X
60			X	X	3
(B)			(1)	(2)	(1)
(C)			(1)	(1)	(X)
(D)			(2)	(1)	(2)

- It is the result of the consolidation of the Summary BOM of a Family of product that share components
- Identify and group the common parts of different products of a Family
- It does NOT describe the way the products are made

Super Bill or Modular Bill of Materials (MBOM)

- It manages the **variants** of an average product according to a **modular approach**
- It is not representative of a physical object but provides information for the Master Production Schedule - **MPS**

For each part, coefficients of use and safety are defined

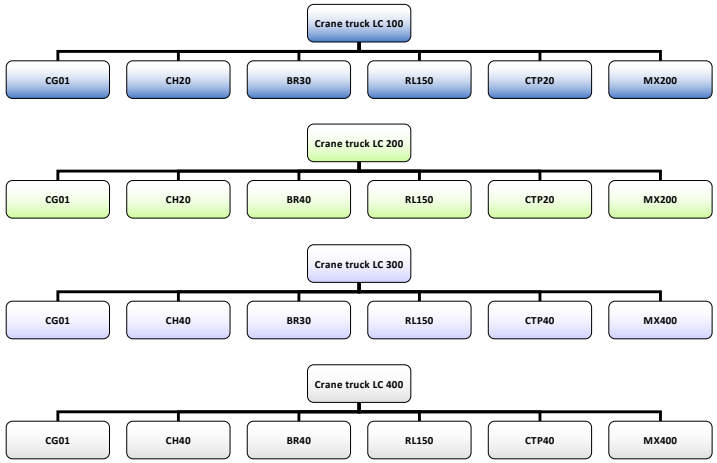
Plan on two levels:
- Average product sales forecasts and
- Effect on specific components

ADVANTAGES
- Increasing the stability of trade forecasts
- Simplification in the formulation of the MPS

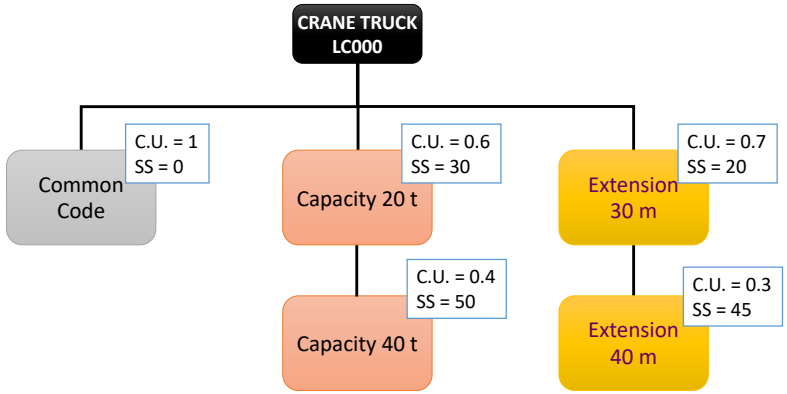
Example 1

		MODELS			
Code	**DESCRIPTION**	**LC100**	**LC200**	**LC300**	**LC400**
CG01	DRIVING CAB	X	X	X	X
CH20	MINI FLOOR (20 t)	X	X		
CH40	MAXI FLOOR (40 t)			X	X
BR30	SHORT ARM	X		X	
BR40	LONG ARM		X		X
RL150	FIFTH WHEEL	X	X	X	X
CTP20	LIGHT COUNTERWIGHTS	X	X		
CTP40	STRONG COUNTERWIGHTS			X	X
MX200	MEDIUM CAPACITY TIRES	X	X		
MX400	HIGH CAPACITY TIRES			X	X

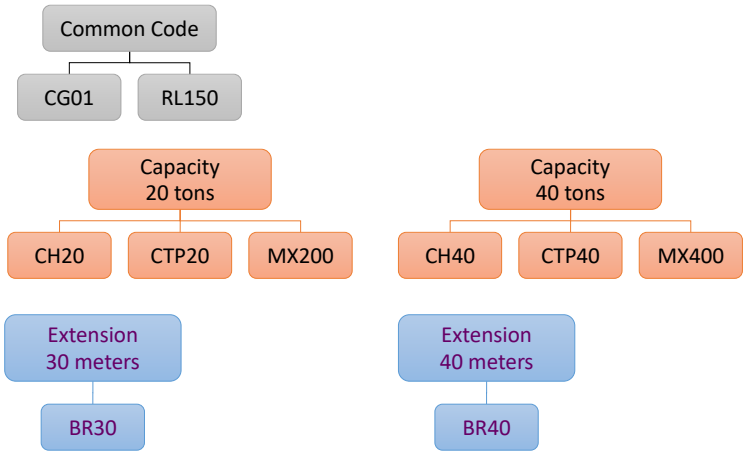
Example 1 – Four traditional BOM (different product)



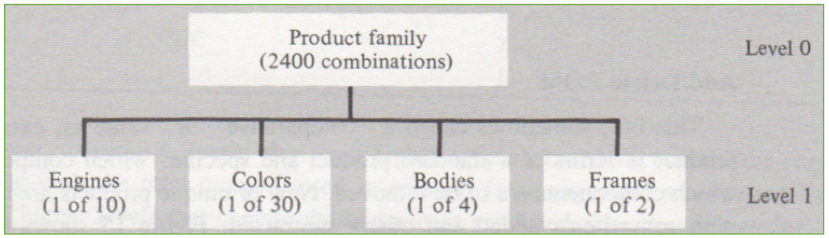
Example 1 – Modular Bill of Materials (MBOM)



Example 1 – Modular Bill of Materials



Example 2



- (10) (30) (4) (2) = 2400 product configurations
- Considering separate BOM is reasonless
- If data or forecasts on the entire family and on the "popularity" of the different options are known, it is possible to decompose the family into the forecast of the individual options
- Using the modular approach each of the options or modules will have a MBOM result in 10 + 30 + 4 + 2 = 46 BOM

Exercise 1

Product Z presents the Intended BOM in the figure opposite.

a. How many assemblies (F) do you need ?
b. How many components (50) ?
c. Are the quantities of the component (50) always required on the same date ?

Part number			Quantity/assembly
Z			—
·	A		1
·	·	80	6
·	·	110	6
·	·	F	3
·	G		2
·	·	50	4
·	·	70	4
·	·	90	1
·	K		2
·	M		2
·	Q		1
·	R		1
·	·	50	4
·	·	70	4
·	·	D	1
·	50		1

a. (F): 3
b. (50): 13
c. No. 12 before and 1 after

Exercise 2

- The SM company received an order from the navy for 20 propulsion units
- A powertrain consists of 2 engines, each of which needs a reducer
- A reducer contains 5 gears, each of which uses ½ of the raw steel component
- The available stock in the inventory of each component/assembly is shown in the table

a. Build an appropriate BOM
b. Determine the net requirement of the materials to be purchased to complete the order
c. Determine the quantities to be produced/assembled for each sub-assembly
d. Evaluate the ending inventory
e. How many types of BOMs should be used?

INV (t-1)	
Engines	13
Reducer	22
Gear	215
Raw steel component	67

b. c. – P(t)	
Engines	27
Reducer	5
Gear	0
Raw steel component	0

d. – INV(t)	
Engines	0
Reducer	0
Gear	190
Raw steel component	67