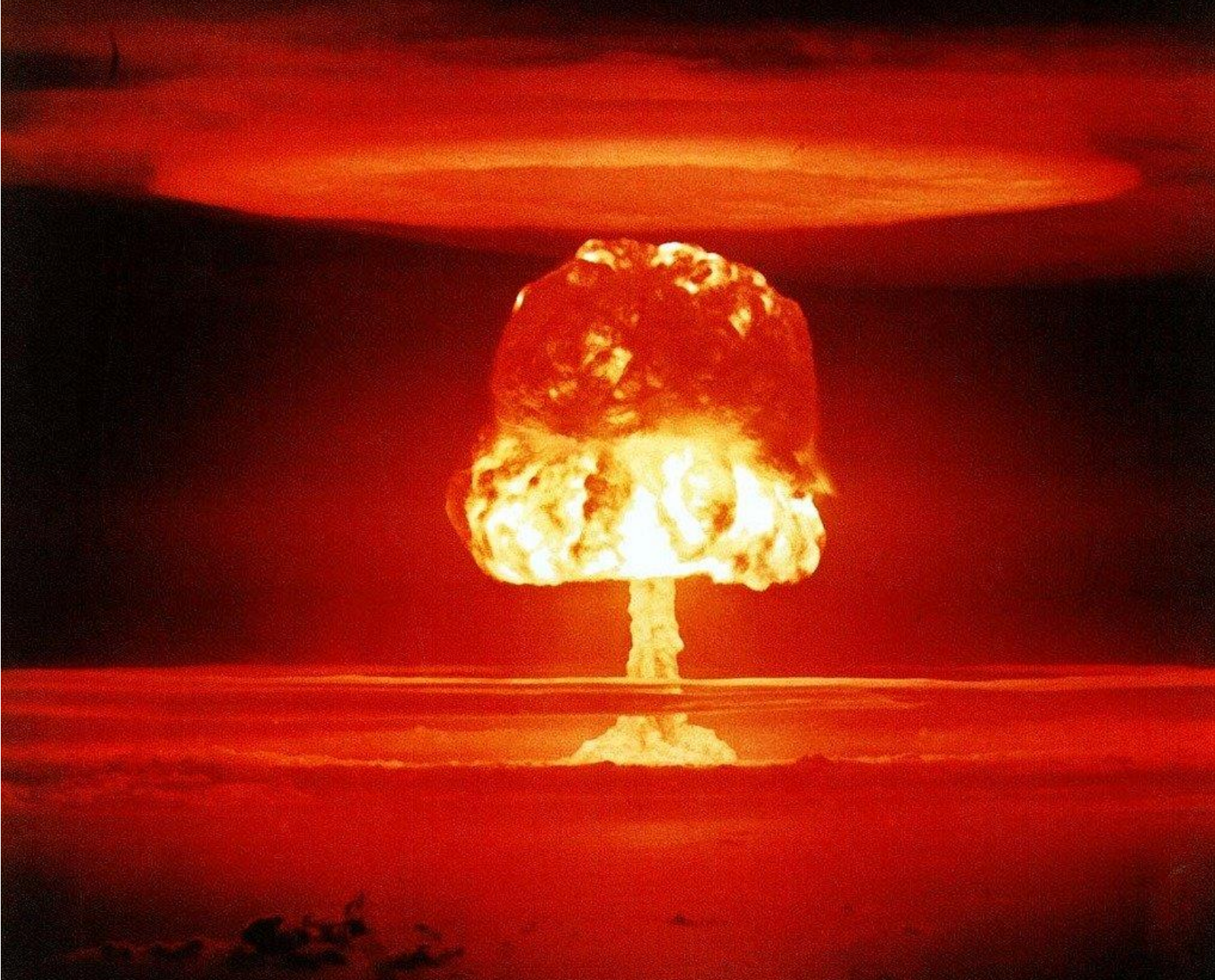


# Ticking Time BOM:

## Crucial Bill of Material Mistakes and How to Avoid Them



### Abstract

Have you ever asked yourself why bills of material (BOMs) are so complex to understand and how small problems can trickle down to become large problems with devastating results? The BOM is unquestionably one of the most crucial pieces in all manufacturing environments – especially in complex assemblies. This is compounded in engineer-to-order environments where there is constant change and custom designs making it much more likely that the BOM will have issues. So what can go wrong? BOM mistakes impact product quality, material planning, manufacturing costing, production and resource scheduling, and other areas of the business. This document provides some insight into common bill of material mistakes with tips on how to avoid them to save time and money – to make high quality products faster and at less cost.

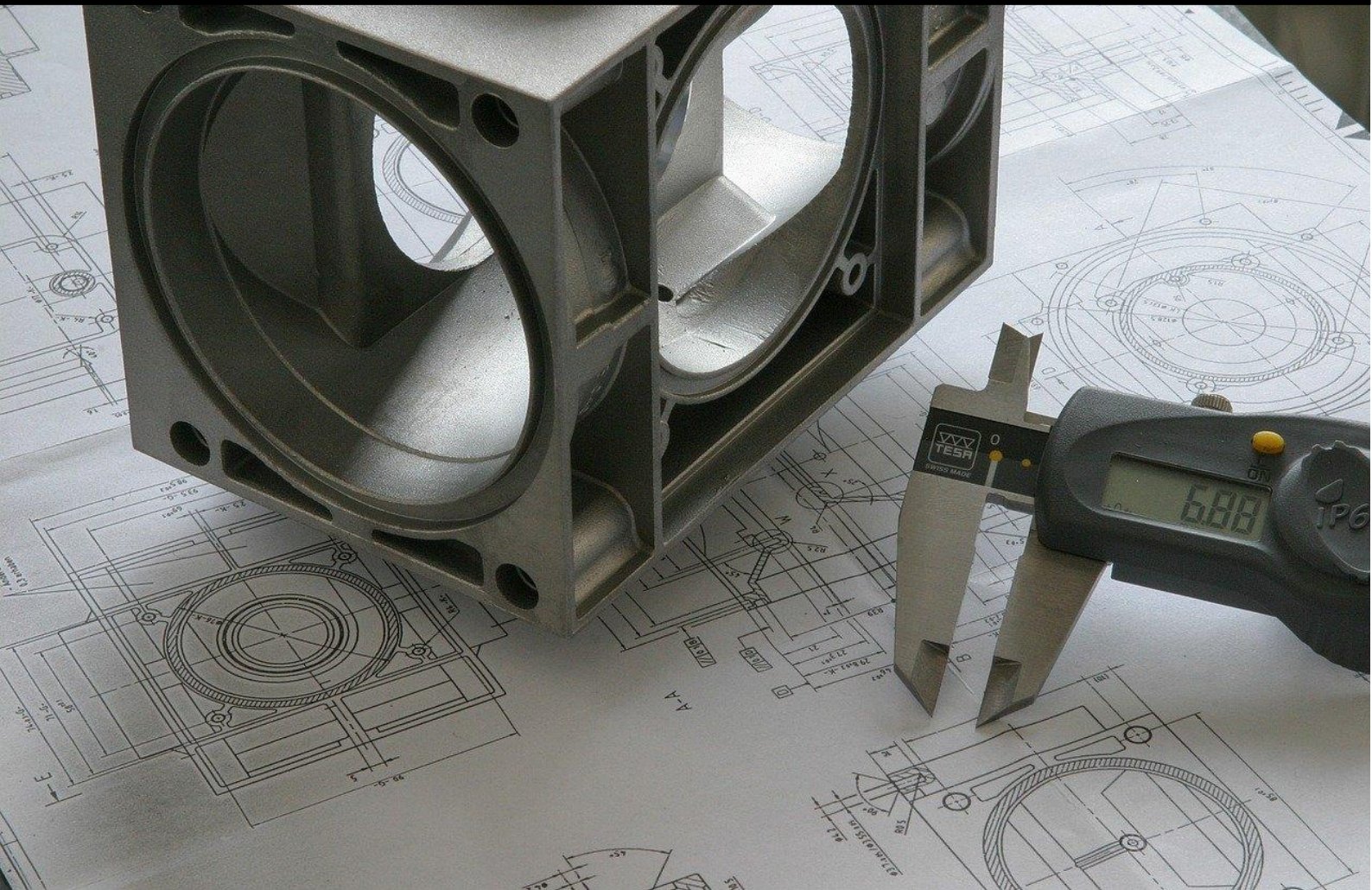


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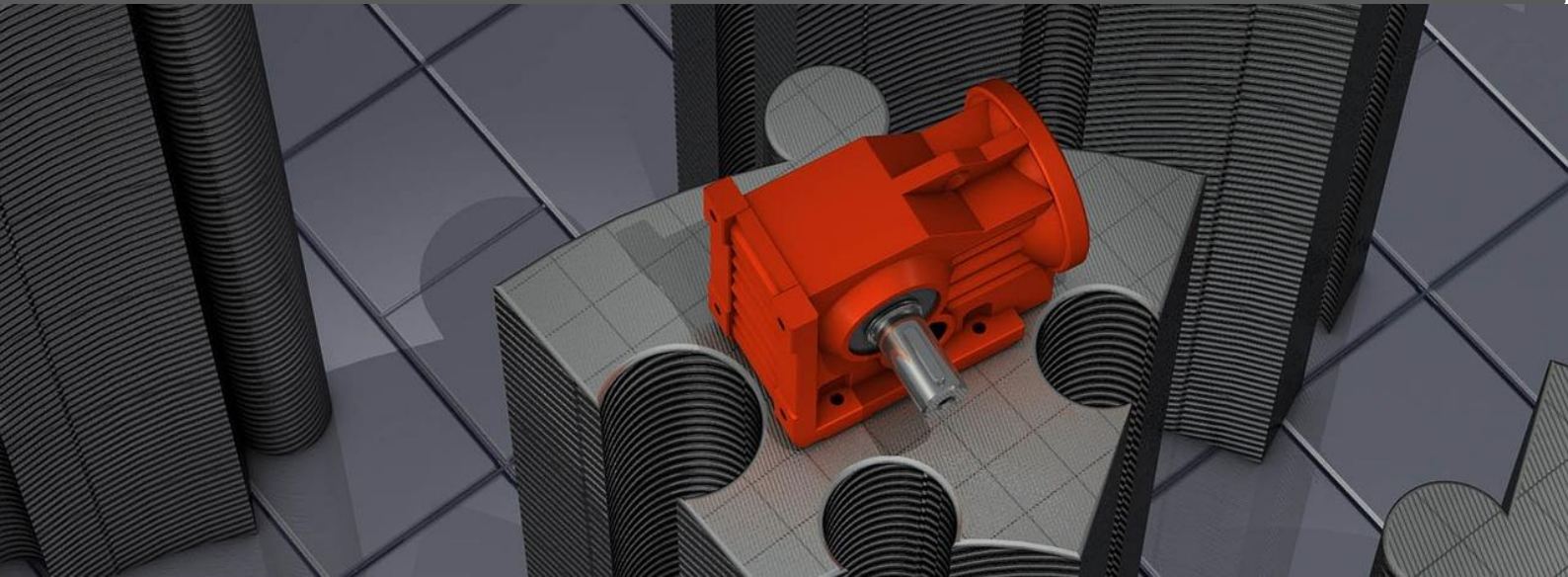
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We cannot solve our problems with the same thinking we used when we created them.

-Albert Einstein







## Introduction to Common BOM Mistakes

As a CAD designer or IT manager, have you ever asked yourself why bills of material (BOMs) are so complex to understand and how small problems can trickle down to become large problems with devastating results? The BOM is unquestionably one of the most crucial pieces in all manufacturing environments – especially in complex assemblies. This is compounded in engineer-to-order environments where there is constant change and custom designs making it much more likely that the BOM will have issues. After all, it is difficult to get everything right when you're working with hundreds or even thousands of highly-engineered finished goods and assemblies – each containing multi-level bills of material with hundreds or thousands of parts each.

So what can go wrong? Engineers not armed with all of the data from the ERP system working in CAD may design parts that utilize incorrect or obsolete items. They may not understand how a small design change impacts production and scheduling. The design may not take into account manufacturing costs including not only the cost of the raw materials but also the costs for labor, outside processing, and other downstream manufacturing-related activities. They may also design products that have adverse impacts on production scheduling. Further, they may not be aware of material specifications or attributes necessary to produce a product desirable by customers – or the majority of their prospective customer market. Lastly, designs and engineering bills of material may not be structured for optimal manufacturing execution. Engineers often have little impact or input on how the parts they design are actually produced. IT and manufacturing operations may implement the manufacturing bill of material completely different than engineering intended. They may flatten the bill of material or identify specific component bills as phantoms. All of these decisions can have dramatic effects on purchasing and material planning and production and labor scheduling.

All of these mistakes can be avoided and none are necessarily the fault of the designer. They do the best they can with the information available to them. The key is to arm manufacturing engineers with the right information that is accurate and up-to-date. Second, automate data and processes to eliminate bottlenecks and data entry or omission errors.

This document provides some insight into common bill of material mistakes with tips on how to avoid them to save time and money – to make high quality products faster and at less cost.

## Bill of Material Fundamentals

A Bill of Materials (BOM) is a most vital component of every manufacturer's business. The bill of materials is also essential to ascertain and grade quality for accurate product costing and pricing. A bill of materials (BOM) is essentially a list. A list of what? A list of any product's corresponding costs and quantities. It is at once, a recipe and a shopping list for creating any product. It is a master document for every role in a company's supply chain – from designers to merchandisers, buyers, and sales. It is vital to ensure that a comprehensive and entirely accurate BOM is a part of every tech pack.

A bill of materials describes the various components that create a product. For instance, a laptop is a product. It is a combination of a central processing unit (CPU), RAM, monitor, mouse, and so forth. The bill of materials contains the item number of each component, the quantity required in manufacturing a product and the unit of measure of the item.

One of the core uses of a BOM is to communicate with manufacturing partners. It virtually ensures every detail is clear to both parties during production. The manufacturing partner may even be the firm's factory. However, where it's an external manufacturing partner, it's essential to realize that manufacturers often work with several different brands and clients. They have plenty of minutiae to track. Such details are easy to mix up or lose.

A bill of materials that is easy to read and easy to comprehend will provide the manufacturer with a better grasp of the time needed for various processes in production. It also makes it easier to ascertain the actual cost of a product and any fluctuations in price. Any industry can use bills of materials can be used in any industry where components or ingredients are used to produce finished goods.

A bill of material is typically comprised of the following information:

- A description of the item
- The item's use in relationship to other items in the BOM (e.g., BOM level)
- Consumption (per piece) with a defined unit of measure
- Placement description
- Projected unit cost
- Supplier name
- Item Status
- Item color or attributes
- Item stocking location
- Item stock status
- Item supplier information
- Current revision level information

## Why is a Bill of Materials (BOM) Crucial?

Engineering and supply chain professionals are sometimes uncomfortable with the bill of materials. The actual document is not their problem and everyone seems to have different views of what the BOM should be and how it should be used in the organization. BOM management touches so many areas of manufacturing from design through to production, material planning, manufacturing costing, production scheduling, and more.

### #1 A BOM Defines Material Requirements for Purchasing

A bill of materials enumerates (lists out) every raw material and its corresponding quantity needed to create a manufactured product. It is almost impossible to procure materials without the BOM. Including obsolete items or the wrong items will trickle down to material planning. The wrong parts will be ordered causing delays in production, excessive costs for rush orders, wasted materials that may not be able to be returned to the vendor, late customer shipments, and in worst-case scenarios – a lost customer account. It is imperative that manufacturing engineers ensure the correct items are defined in the bill of material to avoid item-related mistakes.

### #2 The BOM Impacts Manufacturing Costs & Pricing

How exactly does a bill of materials lay the groundwork for improved costing and pricing? We have mentioned that a bill of materials lists out all materials with their respective quantities and current prices. An engineering BOM (eBOM) likely has little information regarding the cost for component items or the value-added costs of manufacturing. However, in the ERP system, the manufacturing BOM (mBOM) will link to inventory records with purchased costs and manufacturing routings and cost roll-ups with the total cost for manufactured assemblies and finished goods. The mBOM is crucial as it defines the cost to produce

each quantity of parts with scalability to amortize setup and other tasks across quantities. Understanding the manufacturing costs is essential to developing competitive pricing. Without accurate costing – pricing is just an estimate and manufacturers may err on the side of being high to protect against unknown costs preventing them from being competitive or they may set pricing and later be surprised at lower margins as costs may be higher than originally estimated.

### **#3 Product Design Impacts Manufacturing Resources**

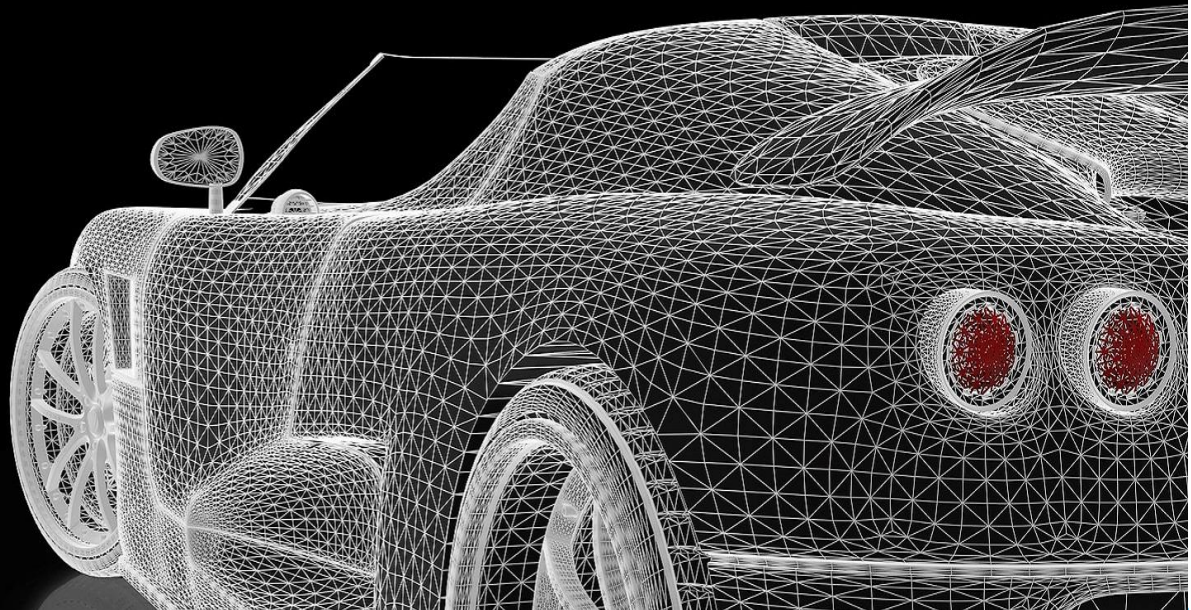
Manufacturing engineers are great at designing fantastic parts. The best manufacturing engineers do this but also design parts that are easier to manufacture. They take into account things like machine setup, reductions in operations, machine and labor availability, and other factors that impact the ability of the company to manufacture the products. For example, a part may be designed with the forethought to make it easier to setup the machine or to produce the part on a particular type of machine that is underutilized or where the manufacturer has several of the same type of machines available to reduce bottlenecks. Further, sometimes the engineer may have flexibility in the design where they can utilize parts that could be produced in-house or purchased from a vendor. This provides ample flexibility for material planners and production scheduling to choose whether to make the part themselves or source it from a vendor depending on current manufacturing jobs and resource constraints.

### **#4 A BOM Defines Manufacturing Standards**

An item in production often needs to run through several steps from inception until the final order. The BOM presents this process in a clear way to the factory and helps them understand how the raw materials convert into the final product. Standards are important because they define how long it takes (or should take) to complete each process, how much scrap to expect at each stage in production, and how machine and labor resources are required to complete the production. Without standards, there is no way to understand if the process is efficient or to identify areas where improvements can be made. Standards apply to both materials and material quantities as well as labor operations and impact not only the product time but also manufacturing costs – even if the company utilizes costing methods other than standard costing as standard costing may be compared to actual costs, FIFO/LIFO costs, actual costs, or average costs.

### **#5 The BOM Impacts Many Internal Departments and External Partners**

The very nature of a bill of materials is to enable all departments to function as one. To create an accurate bill of materials, input from design, procurement, the manufacturer, vendors, and sales, is essential. Merchandisers, designers, factory, quality planners, and suppliers will all reference the bill of materials or various components and elements of the BOM during each phase of product development, engineering change management, and production. Creating a bill of materials means creating a template that can apply to make production jobs quick and easy. They also allow for fast calculation of component materials based on the number of items planned for production.





## Tips for Better BOM Management

To improve BOM management at an organization, we recommend the following steps:

### #1 Create BOMs with Valid Items & Definitions

Creating the BOM itself is not a mountain of a task. However, creating an effective BOM is the biggie. Successful BOM management requires having all viewing parties in mind. It must come alive early in the production life cycle, to all requirements for the product. A BOM is a product's blueprint as we have mentioned. The proper functions and categories (automated or manual) must be a part, and anything that describes the product from start to finish should too. The most salient categories to include are:

1. BOM level
2. Part number
3. Part description
4. Quantity per vehicle
5. Revision level.

There are categories we highly recommend, including:

1. Product lead
2. CAD/drawing availability
3. Supplier/alternate supplier(s)
4. Quote(s)
5. Timing information
6. Plan For Every Part (PFEP), and
7. Production Control

Creating leads early and effectively produces a robust BOM, which ultimately produces successful BOM management.

### #2 Automate Processes

Automation leads to traceability of the parts and product. It provides accountability, in turn. Imagine that several departments manage different BOMs for the same end product (common in almost all manufacturing where engineering manages the eBOM and manufacturing manages the mBOM). An automated platform can act as a conduit for information and provides alignment between data in the two often disparate systems. There are systems available today, such as CADTALK ERP, that leverage artificial intelligence to transform data from system to system (CAD to ERP) and vice-versa to ensure that everyone is on the same page regardless of the system they are accessing.

### #3 Information Flow

The flow of information is critical to BOM management. It can make or mar the process. It is vital to have robust communication between parties viewing or editing the BOM. To achieve the highest BOM clarity, an organization should keep the number of BOM editors to a minimum. Anyone should be able to view, however if BOM management is related to their daily activities or responsibilities. There should also be an owner (or "Admin") who oversees who has visibility and the responsibilities of contributors. Further, information related to the BOM needs to be available (and up-to-date) for others in the organization such as material planners, production scheduling, cost accountants, etc.

### #4 Change Management

All product life cycles involve several changes. Change is more common in some programs or products than others. These changes can happen at any point during the life of the product (design, prototype, launch). This process is in tandem with proper information flow, so all parties must duly communicate when there's a change relating to the product. Conclusion

Creating a bill of materials (BOM) is quite an involved process. There is so much to keep track of, but we have managed to condense the essential items for creating bills of materials. There are many ways to manage engineering changes. Some companies choose to do so within their CAD system while others implement product data management (PDM) or product lifecycle management (PLM) applications and others still manage the process manually, in disconnected applications, or within their enterprise resources planning (ERP) business systems using an ECO or ECN module. Whatever process you use is up to you so long as it works and provides a holistic solution that serves the needs of everyone involved.

## Conclusion

Bills of material can be complex. There are many departments responsible for BOM management and various ways to manage them effectively within CAD, PDM, PLM, ERP, and other systems. Manufacturers who fail to manage bills of materials affectively will likely waste time, lose money, and be less competitive as small issues in the BOM can trickle down to have dramatic impacts throughout almost every area of the business – from production to material planning, costing to resource scheduling, and accounting to quality. Manufacturers may not know where to turn for information, a good start is to document what you have today, where issues seem to occur, and the map out a business process flow to identify the current and ideal flow of data and processes related to your bills of material. Seek the help of consultants, your technology partners, or look to specialized providers of integration applications to provide advice and solutions to streamline and automate the processes.

## About CADTALK

CADTALK Software leverages powerful artificial intelligence to transform engineering CAD, PDM, and PLM bills of material into manufacturing bills of material, routings, and items in popular ERP applications streamlining the engineering to manufacturing hand-off by 80%. Additional modules and products are available to automate and transform data between ERP, engineering, configure price quote (CPQ), nesting, and other connected business applications. CADTALK offers consulting services to help IT managers evaluate, implement, and integrate business applications and processes. Contact us today for a free consultation, personalized demonstration or trial.

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