



BOM Management Buyer's Guide

Enable Digital Transformation with Digital BOMs

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Introducing the Buyer's Guide

Managing Bills of Material (BOMs) is a fundamental need for any manufacturer. Without effective control of product structures, companies struggle with inefficiency and errors. On the other hand, improving the maturity of BOM-related processes helps manage complexity, increase product personalization, improve efficiency, prevent mistakes, and enhance collaboration across departments and the supply chain.



The guide is composed of sections covering software, service, and vendor requirements plus some special considerations.

Improving the maturity of BOM-related processes helps to manage complexity, increase product personalization, improve efficiency, prevent mistakes, and enhances collaboration across departments and the supply.

The resulting benefits can be strategic, leading to increased innovation, agility, and faster time to market that impact top-line financial performance. BOM management is now essential as the foundation for the digital enterprise and serves as the backbone of the digital twin. Effective BOM management is also critical for manufacturers to confidently change products to adapt to market challenges like chip shortages and supply chain disruption.



Diagnosing BOM Management Issues

Many companies operate with ineffective, outdated, or immature BOM management processes without recognizing what it costs them in poor efficiency, excess cost, poor quality, and lost time. Let's review some common problems in manufacturing that can be traced back to a root cause of poor BOM management.

Ineffective BOM management manifests itself in many ways, including:

- Errors in manufacturing
- Poor first-pass yield
- Ordering the wrong parts
- Delays due to part shortages
- Difficulty identifying and implementing alternates
- Slow time to full-volume production
- Late identification of manufacturability or serviceability flaws
- Inability to confidently adopt engineering changes
- Challenges personalizing products

- Poor traceability
- Compliance issues or excess effort to comply
- Scrap and rework
- Slow review and approval processes
- Inability to share product information with downstream systems
- More...

These BOM-related challenges result in delayed time to market, quality problems, poor productivity, and excess cost. They can also damage customer relationships. But all too frequently, companies suffer from costly issues without recognizing the root cause is poor BOM and configuration management. Companies simply can't afford these problems at this time when they need to increase agility and innovate rapidly despite rising disruption and complexity.



Many companies operate with ineffective, outdated, or immature BOM management processes without recognizing what it costs them in poor efficiency, excess cost, poor quality, and lost time.

Companies suffer from costly issues without recognizing the root cause is poor BOM and configuration management.

The BOM Management Status Quo

Why does poor BOM management lead to so many issues? Today, many companies manage BOMs through methods that aren't enterprise-ready, including documents, spreadsheets, or embedding the BOM into CAD drawings. For example, they may manage BOMs on drawings because they can control them. But these approaches are difficult to maintain, not widely visible, and very challenging to search. These approaches lead to negative consequences because there isn't a single place to find current, accurate BOM information.

Many companies manage BOMs through methods that aren't enterprise ready, including documents, spreadsheets, or embedding the BOM into CAD drawings.

Further, the BOM is a critical part of the digital thread. It serves as a resource for many activities along the product lifecycle. It can't be locked up in Engineering. Downstream departments, including Sourcing, Quality, and Manufacturing, need accurate BOM information. Managing the BOM on the drawing, for example, doesn't allow others to access product data until the drawings are released, when it's too late.

Instead, downstream departments should have access to the latest information and visibility to the current state of release. Early visibility enables concurrent design for manufacturing processes, service procedures, product documentation, sales collateral, and more.

How companies collaborate on their BOMs can also be problematic. Some companies try to provide downstream access to product structures in ad-hoc ways, such as emailing spreadsheets. These informal methods inevitably lead to inaccurate data and multiple, conflicting versions. This leads people to make errors and bad decisions because they're working on the wrong data.

Finally, because BOM data is often developed in an Engineering-centric view, many departments will copy the data into their own spreadsheets or systems to add their own perspective, compounding the problem and leading to outdated information and errors from translation. In addition, the information isn't easily refreshed as designs mature or engineering changes are made. This is part of the reason that our How to Reduce Non-Value-Added Work in Engineering research shows that engineers work on outdated data 29% of the time, on average.



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The BOM Management Business Case

Now that we've identified some of the issues resulting from poor processes, let's discuss the improvements companies can make by digitizing BOM management and making it the foundation of the digital thread and digital twin. First and foremost, it helps alleviate the inefficiency, errors, and quality issues reported above – reducing cost and speeding time to market.

Mature BOM management capabilities are also the foundation for significant additional business value. For example, having a digital BOM in place is critical to supporting a model-based enterprise (MBE) or product customization strategy. It's also the foundation for numerous digital enterprise improvements including applications that rely on trusted product information to support AR, VR, and IoT applications.

Despite the value, many companies don't develop a formal ROI to justify their projects. They recognize it's a basic, fundamental capability for a manufacturer. In our experience, the people who most want to improve BOM management practices, barring the regulatory need to do so, are those that have worked in a mature environment in the past and recognize it as a basic necessity.

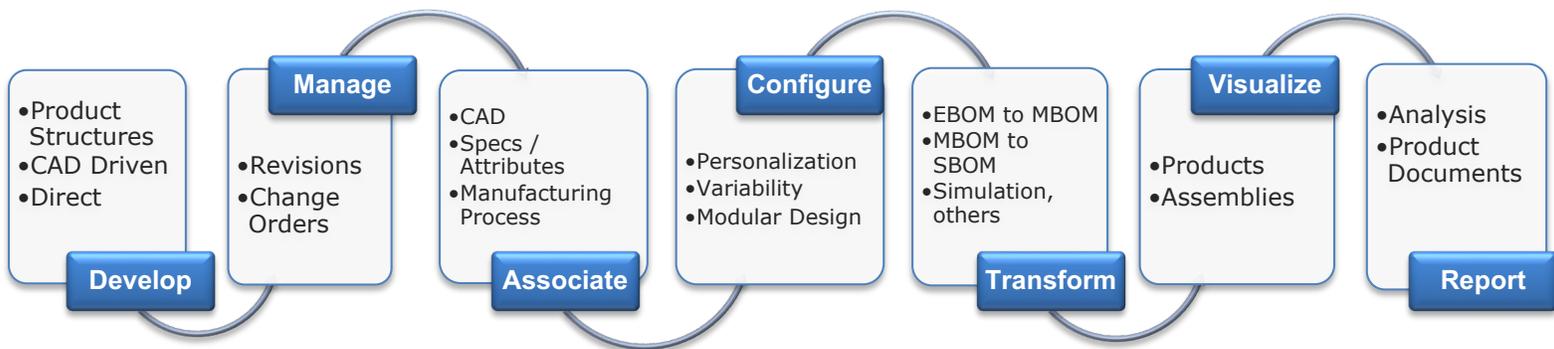




Analyze BOM Management Solution Capabilities

Perhaps the most obvious place to start when evaluating new software solutions is functionality. This section covers multiple types and uses of product structures, including Engineering BOMs (EBOM), Manufacturing BOMs (MBOM), Service BOMs (SBOM), and others such as those used for simulation or compliance analysis. For the purposes of this analysis, we've broken BOM management into seven main focus areas:

- Developing product structures
- Managing revisions and change
- Supporting product variability
- Associating information
- Transforming BOMs
- Visualizing products
- Reporting, analyzing, documenting



It's important to recognize that these requirements are *in addition* to the basic needs of managing product data, as most companies will extend their PLM environment to manage BOMs. These solutions provide platform capabilities such as access control and IP protection that serve as a critical foundation for effective BOM management. These basic capabilities for managing data can be found in our PDM Buyer's Guide and include controlling, accessing, and sharing product data:

- Controlling and securing product-related data
- Quickly finding and reusing information
- Sharing product knowledge with other departments (and beyond enterprise boundaries)

Create / Develop Product Structures

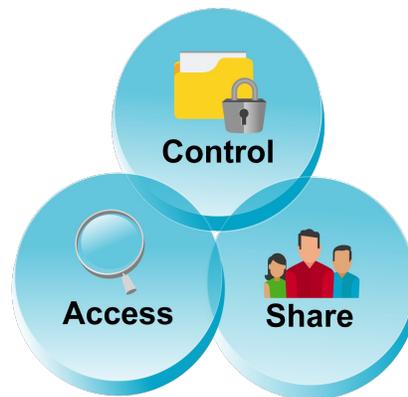
- Product Structures
- CAD Driven
- Direct

Develop

Perhaps the obvious place to start is with the ability to define BOMs. It's important to be able to easily develop product structures of different kinds, including EBOMs, MBOMs, and more. We'll discuss these in more depth in the "Transform" subsection.

Clearly, a user should be able to enter a BOM manually from a screen by selecting a combination of materials, components, or lower-level assemblies.

Systems should also be able to accept and validate an input file, for example, a spreadsheet or XML file, to import / upload BOMs from another system or in a "mass load" scenario. Finally, the system should be able to develop BOMs from underlying engineering tools for efficiency and to prevent manual transcription errors, also known as the "bottom-up" approach.



Of these, the most complex scenario is the bottoms up creation from a Computer Aided Design (CAD) tool. This scenario requires the BOM management solution to digitally interpret the contents of the CAD structure. CAD systems typically contain a lot of information about a product, making good CAD integration a primary need.



PLM provides platform capabilities that serve as a critical foundation for effective BOM management.



Of course, it would be incorrect to assume that companies only have a single CAD system feeding the BOM. While many companies might have a primary CAD system, it's important to point out that many have a multi-CAD environment. This may include multiple mechanical CAD (MCAD) systems or an electronic CAD (ECAD) system.

Therefore, the EBOM should incorporate electronic data from both MCAD and ECAD. It should also be able to incorporate software components from an Application Lifecycle Management (ALM) solution, sometimes identified as software "parts." The various design elements should be managed together in the context of the mechatronic product and should track the interrelationships between design disciplines.

It's important to be able to easily develop product structures of different kinds, including EBOMs, MBOMs, and more.

TABLE 1: FUNCTIONAL REQUIREMENTS FOR CREATING / DEVELOPING PRODUCT STRUCTURES

REQUIREMENT	CONSIDERATIONS
Creation from CAD	"Bottoms up" creation from CAD interpreting embedded intelligence and metadata contained in the model
Import	The ability to mass load and validate data from external sources, with exception reporting and error handling
Manual creation	"Top-down" BOM creation by selection parts or dragging and dropping them from a list
Integrated part definition and classification	The ability to define and classify parts for inclusion in BOMs, tracking specific data by part class
Multi-CAD	The ability to integrate with different CAD systems
ECAD	The ability to integrate with electronic CAD systems
Software references	The ability to incorporate or reference product software that helps make up a product

TABLE 1: FUNCTIONAL REQUIREMENTS FOR CREATING / DEVELOPING PRODUCT STRUCTURES

REQUIREMENT	CONSIDERATIONS
Multidiscipline BOMs	The capability to manage mechanical, electrical, and software line items in context, including tracking relationships between parts from different disciplines
Supplier / manufacturer parts	The ability to incorporate or reference parts with external identifiers and references on the BOM
Multilevel BOMs	The ability to create assemblies and subassemblies, “nested” BOMs
Centralized access	A central location that makes BOMs available across the enterprise and selectively into the supply chain.
Searchable	The ability to easily find and retrieve BOM data in multiple ways, including a “where used” search
Substitutes / alternates	The ability to identify valid part alternatives specific to a BOM
Reference designators	The ability to include a part multiple times in a BOM to reference different occurrences in an assembly or drawing

Manage Revisions / Configurations / Change

The next collection of requirements represents the functions needed to manage a BOM over time. Managing a BOM may seem straightforward until you consider the number and complexity of revisions and the need to support a structured change process.

BOMs need to support the evolution of a product over time, including a change of status or “state” that impacts availability and rules for downstream functions. For example, BOMs / product revisions can be released from a work-in-process (WIP) state to the factory for production. In the same way, companies can use a controlled change management process to react quickly to market, supply chain, or quality changes without introducing errors. This typically involves the use of an engineering change order (ECO) for initial release or to introduce BOM changes to the plant and other downstream functions.

Another aspect of BOM management is quickly finding and reusing BOMs. Engineers do not typically start from scratch to develop a new product. They should be able to quickly find and modify an existing BOM to create a new product and selectively copy associated data. Similarly, engineers should be able to quickly identify BOMs that are impacted by the change of a product or part. For example, if they want to change an assembly, they must understand where it is being used across all BOMs and analyze the potential “domino effect” of the change.



Engineers should be able to quickly identify BOMs that are impacted by the change of a product or part.

TABLE 2: FUNCTIONAL REQUIREMENTS FOR MANAGING PRODUCT STRUCTURES

REQUIREMENT	CONSIDERATIONS
Effectivity rules	Ability to track the effectivity of a BOM or BOM line item by date, status, ECO, and other applicable rules
Release control	The ability to manage the BOM release management process and state
Where used	The ability to quickly assess where a material component, or assembly is used in higher-level assemblies (BOMs)
Change impact analysis	The ability to quickly determine the impact of changing an item or BOM
Link ECO to BOM lines	The ability to manage change by BOM and/or BOM line
BOM compare	The ability to easily compare similarities and differences between BOMs, ideally in both “redlined” views and a product visualization

Support Product Variability

It's important to recognize that not all products have a single valid revision and BOM. While best practice dictates a new part number for each unique configuration, this is not always practical for parts with many variants. Manufacturers are offering increased customization and product personalization and allowing their customers to tailor products to their needs. In some industries, like Industrial Equipment, this is simply the nature of products that need to fit into an existing environment. Increasingly, however, companies are choosing Configure to Order (CTO) and/or Engineer to Order (ETO) as a competitive differentiator.

ETO and CTO requirements are out of the scope of this Buyer's Guide, but it's important to recognize the demands that this business model places on BOM management. For example, one approach is to create an "overloaded" or "150 percent" BOM that carries all possible components and assemblies. Then, the BOM is filtered based on configuration codes or rules to create an order-specific product structure, ensuring a valid configuration.

One of the key considerations for managing BOMs in a CTO scenario is that any rules or configuration options must be change-managed and revision controlled along with the rest of the BOM data. These rules are crucial to revision and configuration management and should be considered an integral part of the product structure definition.

TABLE 3: FUNCTIONAL REQUIREMENTS FOR SUPPORTING PRODUCT VARIABILITY

REQUIREMENT	CONSIDERATIONS
Configuration rules	The ability to associate configuration codes or rules to BOM lines (approaches vary, ETO / CTO configuration requirements are not covered fully here)
Variant management	The ability to define concurrently effective variants of the same product
Change / revision control	Change and revision control procedures should extend to configuration data and rules
Modular design	The ability to define product modules or subassemblies that can be quickly brought together based on order parameters
Overloaded BOM	The capability to define a BOM that spans variants and includes all potential components, also known as a "150% BOM," so appropriate BOM lines can be selected by configuration

Associate / Bills of Information

- CAD
- Specs / Attributes
- Manufacturing Process

Associate

Managing an unambiguous, centralized list of parts required to produce a product is valuable.

But today's products have become far more

complex, requiring a combination of mechanical, electrical, and software components.

Designers now have to collaborate and manage tradeoffs at the systems level, spanning engineering disciplines. To support this, companies must expand their BOMs to incorporate a full, multidiscipline product structure that includes mechanical, electrical, and software in a single, digital BOM. This creates a complete, contextualized systems view of their products.

Approaches to managing the different components may vary. For example, some companies may track work-in-progress (WIP) software in a dedicated Application Lifecycle Management (ALM) tool. Then, they may check in

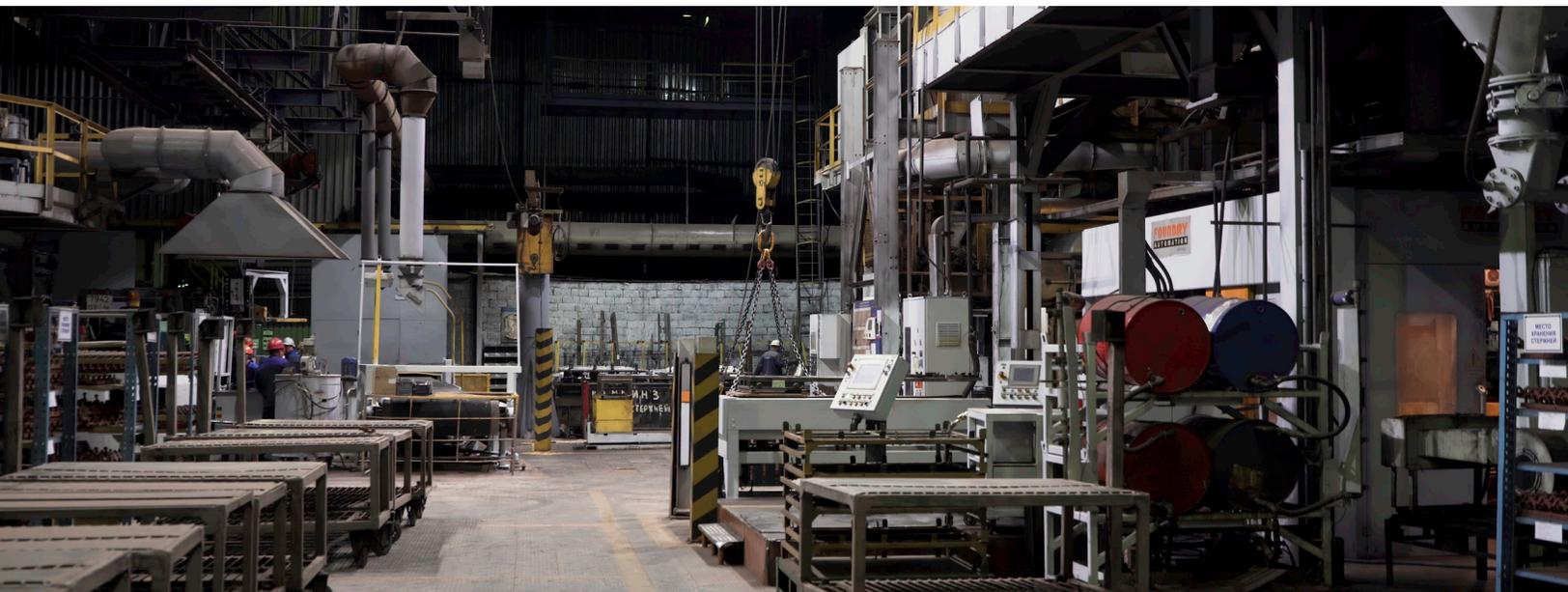
either the resulting executable software file or simply a reference to the software to manage version control.

The value of an integrated BOM management system can go far beyond the elements that make up a product. Producing, selling, and supporting a product requires a wealth of information that's typically stored in standalone, and frequently ad-hoc, systems. Expanding the BOM by creating references to applicable information extends the value of centralized, trusted, revision-controlled data to a host of other functions. It's essentially a bill of information.

Associating information with the BOM allows companies to manage data in the context of the product and discourages duplicating data so it can be kept up to date and in context centrally. It also provides the foundation to perform a much more thorough impact analysis to identify the impact of proposed changes.



Associating information with the BOM allows companies to manage data in the context of the product and discourages duplicating information so it can be updated centrally.





This unlocks data from drawings so it can be managed independently. For example, companies may traditionally include the BOM and information like an Approved Material List (AML) on the drawing. This creates a challenge because that information may be final but can't be made available to downstream departments until the full drawing is released. In addition, it requires companies to re-issue drawings when information not required for the drawing itself changes, but simply uses the drawing as a "container" for additional information. The product data should be managed as a part of the digital twin and not on the drawing.

Items commonly associated to the BOM help provide rich data about a product:

- CAD data
- STEP files
- G-Code (CNC, additive)
- Specifications
- Requirements
- Finishes

- Test procedures
- Drawings
- Sourcing information
- PCB design
- Schematics / layout
- GD&T
- AML / AVL

Note that this information could be in the form of documents, but it's much more valuable if they are objects in the database that can be searched for and interpreted programmatically. This information then becomes a part of a comprehensive digital thread, not locked away in files.

An effective BOM solution should maintain relationships between different aspects of the digital twin. For example, the appropriate software release for a particular hardware configuration. The key is to manage these complex relationships and provide central visibility and configuration management across design disciplines.

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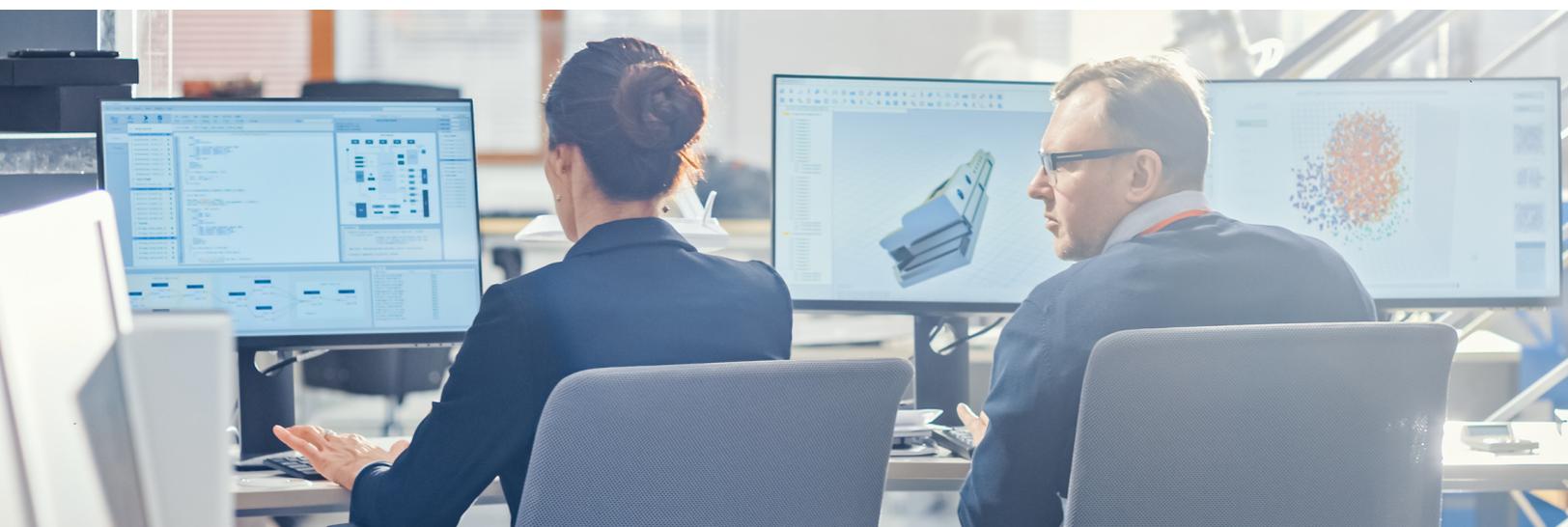


TABLE 4: FUNCTIONAL REQUIREMENTS FOR ASSOCIATING BILLS OF INFORMATION

REQUIREMENT	CONSIDERATIONS
Associate documents	The ability to reference documents stored in the database to specific BOMs or BOM lines
Manage relationships	The ability to manage the relationship between BOM items and associated information
Respects revision control	Associations and managed relationships should follow revision, release, and engineering change management processes
MCAD	The ability to associate BOM items with their respective components or subassemblies in an MCAD system
ECAD	The ability to associate BOM items with their respective components or subassemblies in an ECAD system (such as PCB designs)
Software	The ability to link to an ALM system to associate product software
Systems Level Digital Twin	Managing relationships and interfaces between MCAD, ECAD, and software
AML / AVL	The ability to associate (and enforce) approved material lists (AMLs) and approved vendor lists (AVLs)
Quality plans / documents	Associate quality data directly with BOMs and change orders, for example FMEAs or CAPAs
Simulation / test plans	The ability to associate and reference simulation, validation, and quality information in the context of revisions and configurations

Transform BOMs

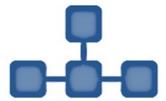
BOM management systems should be able to create and manage multiple types of product structures to support various needs throughout the product lifecycle. These BOMs may be EBOMs, MBOMs, SBOMS, or product structures that serve special purposes like simulation or compliance.

The first set of requirements is the ability to create derivative product structures for these different purposes. The EBOM is typically the source for these downstream structures. For example, companies may add manufacturing-only parts, tools, or consumables to an EBOM to create an MBOM, or add service kits containing parts and documentation to create an SBOM. This means that BOM transformation must include the ability to reclassify item types. For example, a "subassembly" in an EBOM may be classified as a "purchased item" in the MBOM or SBOM. This approach ensures every stakeholder has access to a BOM that is connected to the same underlying source but contextualized to their specific needs.

Transformation should be a guided process that allows for drag and drop and validates that all items are accounted for.

There are many differences between an EBOM and other BOM structures, but they're not completely independent entities. In particular, changes to the EBOM need to be reflected downstream in the derivative BOMs. To support this, derivative BOM parts and components should be able to maintain their relationships with their source. Creating a derivative should not create a copy of the BOM but create the necessary associative transformation with a dynamic relationship between them. This approach helps support concurrent design where product and the production processes, or service procedures, can be developed concurrently. Companies shouldn't have to wait for a released EBOM to begin transformation, they should be able to leverage the work-in-progress EBOM and be notified of changes that must be applied.

In addition to managing change, one of the primary reasons to support BOM transformation is to prevent inefficiency and data errors from re-entering information. It also allows tracking to make sure that all elements of the EBOM are accounted for, or "consumed," in downstream structures.



Derivative BOM parts and components should maintain their relationships with their source.

TABLE 5: FUNCTIONAL REQUIREMENTS FOR TRANSFORMING BOMS

REQUIREMENT	CONSIDERATIONS
Visual BOM line compare	The ability to compare and contrast BOMs visually to ensure BOMs are completely accounted for in transformation
Drag and drop transformation	The ability to drag or link items in a derivative BOM to the source BOM
Managed relationships	Managing relationships / associativity between BOM line items in the source BOM and the derivative BOM
One-to-many relationships	Support differences in product structures, for example one designed part in the EBOM that is assembled from multiple parts in the MBOM, or components added underneath a PCB for bill of substance / compliance rollups
Many-to-one relationships	Support differences in product structures, for example an assembly designed as multiple parts in the EBOM but purchased as a single item or assembly in the MBOM
Ability to augment	The ability to add new items that are not in the source BOM
Structure flexibility	CAD / EBOM structure does not dictate MBOM, SBOM, etc.
Support local differences	Variations by plant, line, geography

TABLE 5: FUNCTIONAL REQUIREMENTS FOR TRANSFORMING BOMS

REQUIREMENT	CONSIDERATIONS
Support tooling, consumables, phantoms	The ability to reference non-inventoried parts that are important to manufacturing or service
Support illustrations	The ability to create illustrations for derivative BOMs
Support part lists	The ability to develop a parts list from derivative BOMs
Support inclusion of additional data	The ability to augment BOMs with additional information like service part numbers

Visualize

Visualize

- Products
- Assemblies

A tabular / textual view of a BOM is valuable, but it's not enough. Engineers and others in the organization need to be able to see how the product comes together in 3D based on the BOM. Companies should be able to instantly view all variants, configurations, and effectivities and ideally provide visual comparisons between them.

These multi-dimensional views can be used for product validation and to support downstream uses such as service documentation and product catalogs. In addition, companies should have the ability to extend validation, design reviews, and downstream product communication

using augmented and virtual reality to provide a more immersive perspective of the product.

These product visualizations can go beyond a static view to share additional images and information ranging from exploded parts lists to highly rendered product videos. Visual approaches can be very beneficial to non-Engineers that need to understand product structures, for example in design reviews. They can include exploded assembly views or even animations based on trusted BOM and CAD data. Product visualization is a topic unto itself.



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TABLE 6: FUNCTIONAL REQUIREMENTS FOR VISUALIZING PRODUCT STRUCTURES

REQUIREMENT	CONSIDERATIONS
3D mockup	The ability to render and visualize a BOM structure using CAD data and relative part positioning
Filtering	The ability to filter the view based on a 3d bounding box or filtering by metadata
Explosions	The ability to provide a view of the parts individually with a reference to their location
Respects effectivity, release info	Visualization and mockups available by different effectivity rules
Visual BOM compare	The ability to show differences between a BOM in a digital mockup
Animate	The ability to show motion paths and motion in digital mockups
Augmented / Virtual Reality	The ability to visualize BOMS and configurations in augmented and virtual reality



Report / Analyze / Document Products

- Analysis
- Product Documents

Report

The final functional subsection covers leveraging BOM information for critical downstream decision-making. A holistic product structure

should enable valuable reporting and analysis. Rich information stored in the BOM should be available for higher-level decision-making across the enterprise, gaining more business value from existing data.

One of the first requirements is the ability to create specialized online views of product structure information. These views should be able to pull in information such as cost, weight, compliance, obsolescence, release status, or other related data from ERP or other enterprise systems.

Reports should also support BOM-centric functions, like viewing the BOM along with release information to get a snapshot of product development status.

Finally, the system should be able to supply BOM data as the source to combine with big data for advanced analytics. The BOM is the digital backbone to contextualize product data for analysis. Contextualizing data is critical for higher-level analytics and requires accurate product structures.

Given the BOM's role as the digital product backbone, it's important to provide product structure data to support a wide variety of digital documentation and communication.



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TABLE 7: FUNCTIONAL REQUIREMENTS FOR REPORTING, ANALYZING, DOCUMENTING PRODUCTS

REQUIREMENT	CONSIDERATIONS
Multilevel BOM	Show multilevel, indented, “exploded” BOMs
Summarized BOM	Provide a “flattened,” summary report that shows all materials on one level, adding up different occurrences of the same item
Parts lists	Create parts lists that include reference designators to identify locations on drawings
Combine with external data	The ability to “mash up” data from other systems with BOM information
Standard reports	The solution should provide standard reports for typical BOM needs
AML / AVL reports	Reports that include AML/AVL information
Saved reports	The ability to customize and save reports
Ad-hoc reporting	The ability to quickly generate reports for unique needs
Technical publications	Creation of fully associative documentation referencing BOM and product data

Assess Service Requirements

Implementation

Beyond the software, there are important things to consider that can help ensure an efficient, effective implementation. Processes like BOM management are well established. BOM management solutions should have standard, best practice processes embodied in the software. Changing BOM processes, however, requires attention to process change. An effective BOM-centric product definition relies on all stakeholders aligning to a set of common data and standard processes.

Many companies are transitioning from informal and non-standardized processes and may need help to standardize approaches across business units or departments. It's important to make sure that business process consulting and guidance are

BOM management is used by many casual, infrequent users. The solution should be easy to use by untrained and non-technical users with no advanced training required.

available for the solution, if needed, either directly from the vendor or from their 3rd party ecosystem. In addition, it's important to ensure that technical resources are available as needed.

Integration

The value of BOM management is much greater when it's integrated with other systems. It's important to ensure the BOM management solution offers integration for your chosen design tools, including ECAD, MCAD, and ALM. It's important to look at the detail of the integration, for example to make sure that engineers don't need to leave their environment to update, access, or release BOM information.

In addition to tool integration, the software should provide enterprise solution integration. Look for integration to ERP, Customer Relationship Management (CRM), Supply Chain Planning (SCP), Manufacturing Execution Systems (MES), and any other solution that requires BOM data.



Beyond the software, there are important things to consider that can help ensure an efficient, effective implementation.

Adoption

The best software won't provide value unless users work effectively with the system. This may require effective process and software training. This training should be available in multiple forms, including self-service.

BOM management is used by many casual, infrequent users. The solution should be easy to use by untrained and non-technical users with no advanced training required. It may be important to configure user interfaces to match company terminology or processes, and the software should support that capability without code modifications.

Support

Companies should also look for rapid, effective assistance for their solution. This should include help capabilities, including self-service support on a global level. It should also include rapid support for new CAD, EDA, or ALM releases and other integration. These solutions aren't always upgraded at the same time as the BOM management system, so it's important to understand how updates are scheduled.

Licensing and Deployment

Many companies are adopting BOM solutions in a Software as a Service (SaaS) cloud model to save time, lower cost, and reduce risk. The cloud can also offer performance, security, and elastic computing benefits that many companies can't achieve internally. Cloud-based solutions are also advantageous because they are upgraded more frequently than traditional, on-premise solutions.

In many cases, the BOM management solution will be an extension of an existing PDM / PLM solution, so the choice of licensing and deployment in the cloud or in a traditional model will be driven by the broader solution offering. We believe it's important to ensure that your vendor has a cloud offering to ensure they retain market relevance, even if your company isn't ready for it.



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Consider Vendor Requirements

Vendor Strategy and Investment

When a company selects software to manage their BOMs, they also select an important partner. One of the most important factors when evaluating a potential partner is their understanding of your business. Managing BOMs effectively goes well beyond the capabilities of a “generalist” software vendor that knows how to store and retrieve data. Companies should look for a software vendor that understands engineering, manufacturing, service, and how to manage product lifecycles. A PLM vendor with successful references in the same industry is a safe choice. In addition to industry, it’s important to make sure the partner is capable of effectively supporting companies of a similar size and in the right geographies.

It’s also important to choose a partner that’s financially stable and investing in both current and future functionality. Companies should perform due diligence to make sure their partner will be around to support and enhance the product, in particular for integrations, as discussed earlier.

But there’s more to it. The vendor should also be investing in the future. Look for their ability to support more advanced needs even if your company isn’t ready for them today, for example to support the evolution to Industry 4.0, Smart Manufacturing, Digital Twins, and the Digital Thread. It’s good if your vendor is a couple of steps ahead of you strategically because the BOM is the foundation of any smart, connected strategy. See the “Prepare for Digital Enterprise” section for more.

Special Considerations

For most enterprise solutions, there are key things to consider that might be unique to a company’s business model, strategy, industry, products, geography, or size. This section covers some of those areas for BOM management. Not all of this will apply to any given company, but it’s important to recognize specific needs that should be included in the selection criteria. We’ve identified industry needs and transitioning to the digital enterprise as additional areas of focus for this eBook.

It’s a good thing if your vendor is a couple of steps ahead of your strategically, because the BOM is the foundation to any smart, connected strategy.

Industry

BOM management is a relatively standard process and the majority of companies find they have similar requirements. But there are cases where an industry has special needs or puts more emphasis on certain general needs. For example, companies in very supply-chain-centric industries like Consumer Goods, High-Tech, or Medical Device should pay special attention to the ability to easily connect and collaborate with suppliers, partners, and customers. Other industries have issues based on the scale of their product structures, such as Shipbuilding or Aerospace & Defense companies that must be able to manage and visualize very complex BOMs with high part counts.

Some industries have strict regulatory requirements. For example, the aerospace industry must maintain an “as built” and “as maintained” BOM that includes serial numbers and a traceable history for the parts in a BOM.

Other industries, such as Consumer Goods, Electronics, and High Tech have compliance and sustainability requirements that demand detailed analysis of the product structures.

Another industry that deserves special attention is the Medical Device industry. This industry has specific legal mandates for tracking product structures and quality, including managing the Device Master Record (DMR), Design History File (DHF), and for some companies a Unique Device Identifier (UDI) similar to the requirements for Aerospace mentioned above. For more on the needs of the Medical Device Industry, please refer to *Tech-Clarity’s Medical Device Manufacturers Software Selection Guide*.



Support for the Digital Enterprise

Looking beyond today, the manufacturing industry is undergoing a major transformation. Our research finds that over one-half of companies report digital transformation has high strategic importance to the long-term business success and profitability of their company.²

Partnering with a vendor that has both foundational capabilities like BOM and Change Management and also more mature digital technologies such as IoT, AR, and VR will provide the capabilities they need to compete in the digital age.

Solid BOM practices and a database-driven approach to managing product structures create an important foundation to support the manufacturing industry in the digital age. Companies now rely on digital data to support the digital thread that tracks product lifecycle data and the digital twin, which is used as a virtual representation of the physical product, to better design, validate, optimize, and support products. They are also transforming product operations and service by monitoring product performance via the Internet of Things (IoT), using the Digital Twin to contextualize IoT data.

It is practically impossible to maintain a digital twin that is accurate enough to provide value without a complete, integrated, and up-to-date product structure.

Companies are also starting to provide manufacturing and service instructions in Virtual and Augmented Reality. This approach maps rich, digital product data into the real world to help provide information at the right time and in the right context. Without a trusted, complete understanding of the BOM, the value of these approaches is severely limited.

Partnering with a vendor that has both foundational capabilities like BOM and Change Management and also more mature, digital technologies such as IoT, AR, and VR will provide the tools they need to compete in the digital age. One of the key things we've learned from digital transformation initiatives is that more advanced solutions require centralized, standardized, trusted, and accurate product contextualization in order to provide value. This makes effective BOM management a strategic requirement for digital transformation.

Conclusion

BOM management helps manage complexity and streamline operations. It provides an important, foundational element that serves as the backbone for all engineering, manufacturing, and service activity. An accessible, trusted source of product structure information is valuable and improves traceability and control.

Effective BOM management provides enterprise-level benefits, improving business performance and alleviating disconnects across the business. The net result is efficiency and cost gains combined with revenue improvement from better collaboration and faster time to market, making BOM management an essential operational tool and a key driver of improved profitability.

Supporting BOM management at the enterprise level requires the right solution. Companies should develop a requirements list that helps encourage a holistic decision encompassing software functionality, service-related needs, vendor requirements, and any special considerations based on their industry, size, and product strategy. Finally, the plan should look beyond current needs to support the digital future where the Digital Twin, Digital Thread, AR, VR, and IoT rely on sound BOM information.



BOM Management provides an important, foundational element that *serves as the backbone for all engineering, manufacturing, and service activity.*

Recommendations

Based on industry experience and research for this report, Tech-Clarity offers the following recommendations:

- Think big, but remain agile and take BOM management improvement in steps
- Recognize the importance of accurate, complete, timely, and accessible product structures
- Develop a comprehensive, multidiscipline, and multi-CAD BOM management capability
- Look for functionality, but extend requirements to vendor and service considerations
- Look for a Cloud / SaaS solution to reduce risk, ease adoption, and ensure vendor market competitiveness
- Consider any special needs for your business, industry, or geography
- Provide the foundation for the digital enterprise to compete today and into the future
- Get started

Companies should develop a requirements list that *helps encourage a holistic decision* encompassing software functionality, service-related needs, vendor requirements, and any special considerations based on their industry, size, and product strategy

Acknowledgments

Tech-Clarity is an independent research firm dedicated to making the business value of technology clear. We analyze how companies improve innovation, product development, design, engineering, manufacturing, and service performance through the use of digital transformation, best practices, software technology, industrial automation, and IT services.

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About this White Paper This buyer's guide is a refresh to our 2019 BOM Management Buyer's Guide.

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About the Author

Jim Brown is the President of Tech-Clarity, an independent research and consulting firm that analyzes the business value of software technology and services. Jim has over 30 years of experience in the manufacturing and software industries. He has a broad background including roles in industry, management consulting, the software industry, and research. His experience spans enterprise solutions including PLM, ERP, quality, service, manufacturing, supply chain management, and more.



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He is actively focused on researching new digital enterprise initiatives and technologies including cloud computing, digitalization, smart manufacturing, AR, VR, and the IoT. Jim is passionate about improving product innovation, product development, and engineering performance through digitalization and the use of software technology.

Jim is an experienced researcher, author, and public speaker and enjoys the opportunity to speak at conferences or anywhere he can engage with people with a passion to improve business performance through digitalization and software technology.

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