



An Arena Solutions whitepaper

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## Beyond BOM 101: Next Generation Bill of Materials Management

# whitepaper

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### Summary

In the world of product development and manufacturing, the bill of materials (BOM) is a critical product information record for both the engineering and manufacturing teams. Traditionally, BOMs have been created and updated in spreadsheets, and communicated to internal teams, outsourced manufacturers and suppliers via email, phone or fax. Usually, final BOMs are also loaded into the ERP systems. However, compressed product lifecycles, geographically dispersed project teams, cost pressures, outsourced partnerships, and stringent regulatory requirements are challenging the traditional BOM management and communication in a number of ways:

- Modern BOMs are large, complex and ever changing. It is inefficient and error-prone to manually make and control changes in their typical spreadsheet format.
- BOMs are highly relational and include various associated data and files. Managing across multiple BOMs and their associated data with static spreadsheets is nearly impossible.
- ERP systems do not have integral processes for engineering change orders (ECOs) and cannot be used to control BOM changes or manage associated files.
- Product compliance requirements are managed manually and separately from BOM, even though compliance status should be an integral part of a product record.
- Throughout the lifecycle of a product, numerous revisions of BOMs are created and communicated to multiple internal and external teams. Keeping everyone on the same latest revision of a BOM spreadsheet is an impossible feat.
- As a tool for internal groups, ERP systems cannot be accessed by external partners and suppliers to obtain product BOM information

Today, new, automated bill of materials (BOM) management solutions are available to help companies effectively manage and communicate product information and succeed in the competitive environment. Companies are able to accelerate their new product introductions, improve collaboration with outsourced partners and suppliers, and achieve compliance with confidence. In a 2007 study, Aberdeen Group, a global research consultancy, reported that Best In Class companies significantly out-performed laggards in new product development (Figure 1). Best In Class companies tend to leverage BOM management tools to improve product development performance and profitability, and are over 50 percent more likely to “leverage centralized product repositories to better capture, share and reuse core information such as items and bills of materials.”<sup>1</sup>

For over a decade, Arena Solutions has helped innovative manufacturers bring better products to market faster with cloud BOM and change management applications that speed prototyping, reduce scrap and help manufacturers collaborate on product changes with strategic partners across the globe. Arena understands the obstacles companies face in effectively managing and sharing their product information, and in this paper we hope to provide insights to these challenges and innovative solutions that help companies succeed.

**Bill of Materials (BOM), noun:**

A term used to describe the 'parts list' of components needed to complete a saleable end-item\*

For example the BOM for a personal computer may list the computer, its major sub-assemblies (board, chassis, modem, keyboard, display, etc.) and additional materials needed for a complete product - shipping box, user manual, packaging, packaging labels, etc.\*

\*source: wikipedia.org/wiki/Bill\_of\_Materials

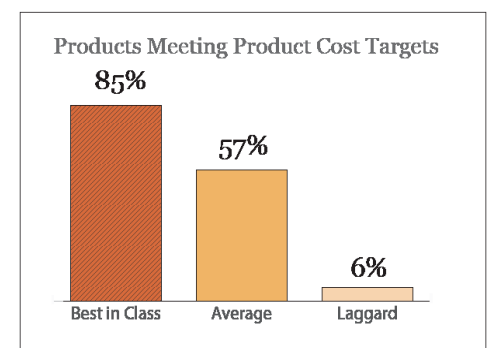


Figure 1: Performance Differences Between Best in Class, Average & Laggard Companies

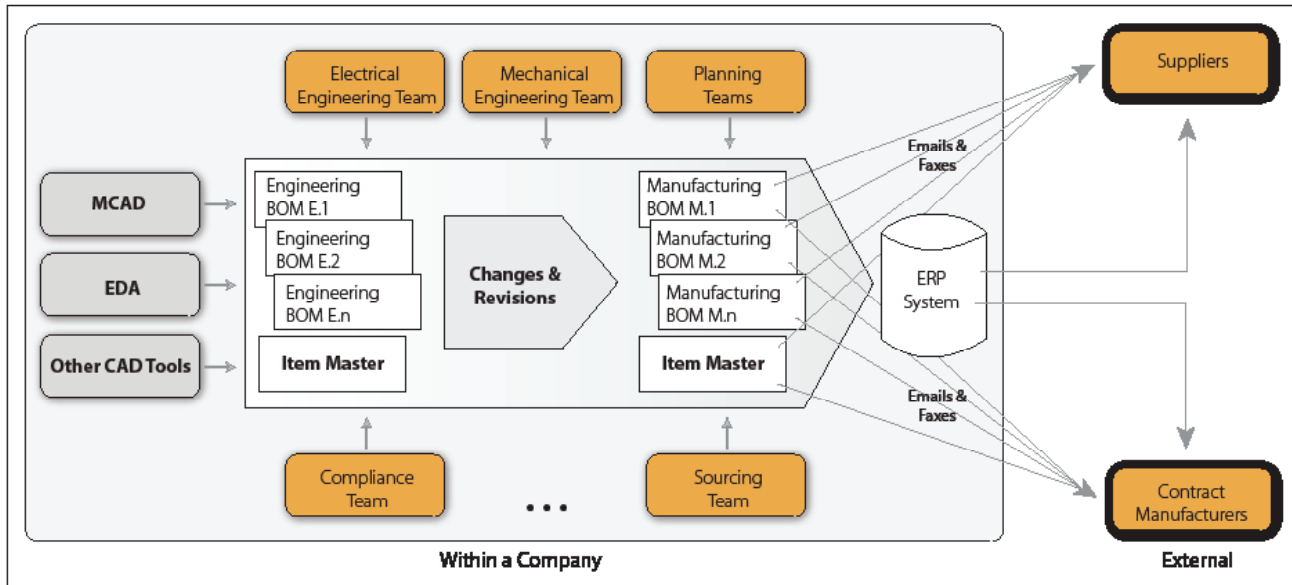
**Beyond BOM 101: Next Generation Bill of Materials Management**

**Current BOM Management and Its Challenges**

**Makeshift BOM Management Tools**

For a new product development project, engineering groups create designs with multiple computer aided design (CAD) tools, such as electronic design automation (EDA) applications and mechanical CAD. To communicate the component needs and cost estimates, an engineering project manager often creates an engineering BOM for the new product in a spreadsheet. As the design progresses toward production, the part-list-like engineering BOM must transition into a detailed manufacturing BOM that includes all the items required to make sub-assemblies and the final product. During this process, numerous project teams contribute to the BOM and item changes (Figure 2). The resulting manufacturing BOM is highly relational and includes various associated data and files, such as design drawings, software files, item files, costing information, compliance status, specification data and supplier information.

Operations, manufacturing and finance typically use Enterprise Resource Planning (ERP) systems to track materials planning, sourcing, and other production related information. Engineering groups are often not inclined to use ERP systems unless absolutely necessary. While a manufacturing BOM and associated item data are usually loaded into an ERP system to manage production sourcing and costs, ERP systems are not designed to be change control or file management tools. Consequently, all changes to items and BOMs have to be recorded, approved and tracked outside the ERP system. Additionally, ERP systems are primarily used by limited groups within a company and generally are not accessed by outsourced partners or suppliers. They do not provide project collaboration capabilities that are necessary to successfully manage product development tasks and milestones across a global supply chain.



**Figure 2: Multiple teams contribute to BOM creation and changes**

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To update and change product information between electrical and mechanical CAD tools and ERP systems, many companies employ spreadsheet software, such as Microsoft® Excel, to manage BOMs and to communicate them to projects teams. Unfortunately spreadsheets are not particularly well suited for the job. Using spreadsheets for BOM management falls short in several areas—change and revision control processes, communication with project teams, compliance management and managing beyond a single BOM.

### **Manual Change and Revision Control**

A modern BOM often includes a complex set of hundreds to thousands of structured items. It is not surprising that poring over thousands of rows and columns in a spreadsheet to modify data leads to errors. Rapid changes during the design and prototype phases result in higher probability of making mistakes. Even after the first product is built, the BOM will continue to evolve—whether due to potential bug fixes, design improvements, part substitutes, or supplier switches—until the product reaches its end of life. The time spent to manually make changes and fix mistakes throughout the lifecycle of a product may amount to a substantial delay in its shipment.

With multiple teams inputting frequent changes, manual revision control processes can easily become overwhelming and chaotic. It is difficult to track which changes have been made to which revisions. There is a lack of “a single version of truth” —the latest product information including BOM—that all project teams can consistently and confidently rely on throughout the lifecycle of a product.

Furthermore, during the product development and manufacturing process, it is often useful to trace back the changes to specific revisions of BOM and make design or part comparisons. It is nearly impossible to do so with a collection of BOM revisions in different spreadsheets.

### **Communication with Project Teams**

The breadth of uses of BOM related information has expanded dramatically. However, companies typically do not want to share the entire BOM with design partners or suppliers. As a result several versions of a BOM, or a partial BOM, have to be created for different audiences. Controlling access to ensure that the right audiences receive only the needed information becomes difficult as the supply chain expands in depth and complexity.

Email or fax is often used to share spreadsheet-based BOMs with project teams in diverse geographic locations. Over time, different revisions of spreadsheets may scatter on various desktops in different organizations. Engineering teams may have a different revision from the operations teams. The contract manufacturer may have yet another revision. The sourcing team may order incorrect parts. The contract manufacturer may execute a wrong build. These mistakes lead to excess or obsolete inventory, as well as significant recall or rework, all of which directly impacts the bottom line.

In a 2007 study with 150 mid-market manufacturing companies, almost half of the respondents said that including partners and suppliers in project planning and execution was difficult<sup>2</sup>. With inefficient manual communication, partners and suppliers do not have consistent visibility into the latest BOM and associated data, and therefore they are not able to make parts trade-off suggestions early in the design cycle. As a result, companies may miss the opportunity to reduce overall product cost and optimize design for manufacturability.

## Beyond BOM 101: Next Generation Bill of Materials Management

Real-time access to accurate product information is a key success factor in product development and manufacturing. Companies must ensure that engineering and operations teams, design partners, outsourced manufacturers, and suppliers all have secure access to a single version of a product BOM. Spreadsheets and manual communication tools do not lend themselves well in providing and sharing such a single version of product truth.

### **Compliance Management**

Under increasing environmental and regulatory pressure, companies must seek cost effective solutions to comply with FDA, RoHS, FCC and other requirements. Manually working with a large volume of data to track compliance status for each revision of each part and its supplier items is difficult and costly, especially across a company's entire product portfolio and global supply chain. Tracing an audit trail and creating required reports through multiple revisions of large spreadsheets amount to a daunting challenge. Additionally, compliance evidence files cannot be attached to a spreadsheet and therefore need to be tracked down separately at an audit. Best In Class companies manage compliance at the part level, including components from suppliers. The compliance status should become a part of the BOM and should be tracked and managed with change control processes.

### **Managing Beyond a Single BOM**

A BOM has layers of data that are interrelated, such as items, Approved Vendor List (AVL), and costing data. In a manual spreadsheet environment, the associated data are updated and communicated separately, yet have to be kept in synch with the BOM. For instance, BOMs and an Item Master are created and updated separately. The inability for a company to manage across multiple BOMs limits its opportunities for categorization and part re-use. Also when a supplier obsoletes an item, it is a tremendous undertaking to find and change the item across multiple large product BOMs that may contain that item. Another example is that engineering often leverages a BOM from a similar previous design as a starting point at the beginning of a new product development. As a result of the lack of visibility into supplier parts, the BOM may include a number of obsolete parts. The issue will only be identified later in the design phase, resulting in a potentially costly redesign.

With a spreadsheet based BOM, files and documentation directly related to an item cannot be attached easily and shared with project teams. Communicating updates and changes to the files or documentation is even more cumbersome. Inadequate in managing a single BOM, a spreadsheet fares even worse when it comes to managing multiple BOMs and related data, files and documentation.

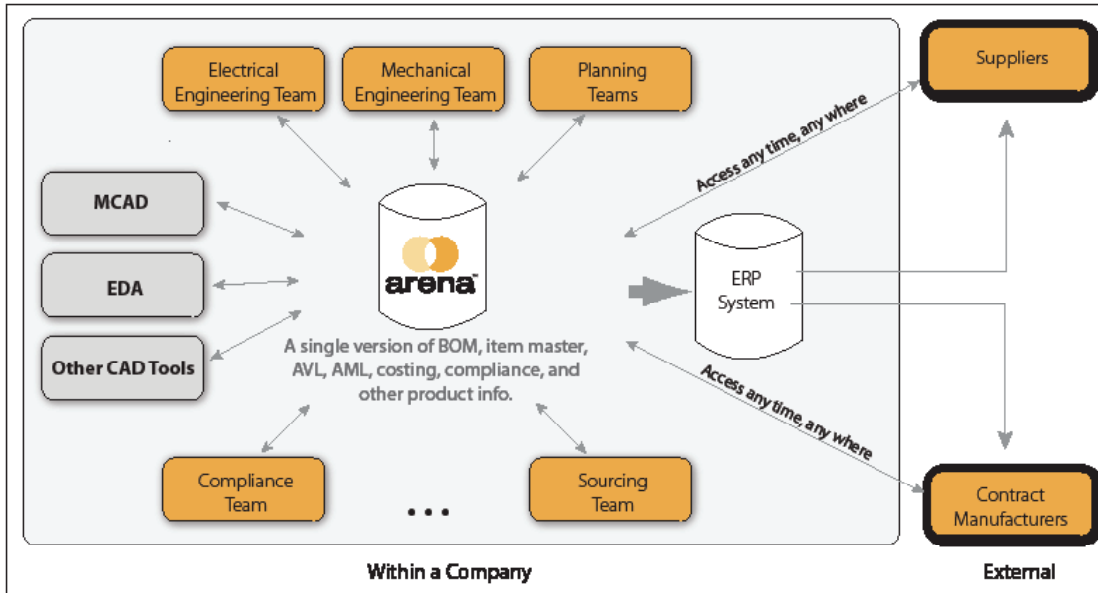
## Next Generation BOM Management

### **New Automated Tool to Manage BOM**

Many seasoned product development and manufacturing teams recognize the significant scope of today's BOM management and the severe limitations of spreadsheets in meeting their objectives. They fully recognize the need for a next generation BOM management solution to replace the inadequate manual spreadsheet tools.

**Beyond BOM 101: Next Generation Bill of Materials Management**

BOMControl, a cloud-based solution for bill of materials (BOM) and change management, bridges the gap between design, engineering and manufacturing with a controlled, centralized way to manage changes to product data. (Figure 3). With up-to-the-minute accurate product information that can be accessed anytime, and from anywhere in the world, BOMControl reduces scrap, speeds time to market and addresses the challenges resulting from spreadsheet-based manual BOM management and inadequate communication channels (Table 1).



**Figure 3: Arena is an effective tool for managing next-generation BOMs**

Typical BOM Challenges	BOMControl Benefits
BOM changes are managed manually resulting in errors and delay.	Changes to product information are controlled and the change process is automated and auditable.
Multiple BOM revisions exist on various desktops, resulting in design, sourcing and manufacturing errors.	Provides a single version of truth—the latest product information, including the BOM and changes to the BOM. Tremendously improves the accuracy and efficiency of product record management.
BOMs are sent to internal and external teams via email or fax, causing delays and prevents effective collaboration.	The latest product information and changes are selectively accessible by project teams, internal or external, anytime and anywhere. The real time access to information encourages and enables participation from partners and suppliers and improves collaboration across global supply chain.
Compliance requirements are managed through manually working through a large volume of data.	To confidently achieve compliance, regulatory, environmental and industrial requirements are managed early at the part level, with associated evidence files. Audit trails are automatically established with item record and change record.
Inability to manage across multiple BOMs limits categorization capabilities and part re-use opportunities.	BOMs are managed in a relational database – BOM items are associated with Item master, costs, AVL, etc. It is easy to access, change, and manage common elements across multiple BOMs, including items, costing data, supplier information, and other product information.
Attaching files and documentation is cumbersome.	Any files or documentation can be attached to any items within a BOM. Changes to these files and documentations are tracked and controlled.

**Table 1: BOM Challenges and BOMControl Benefits**

## Beyond BOM 101: Next Generation Bill of Materials Management

To quickly realize potential benefits, a bill of materials management solution must be built for ease of use by globally distributed teams and their extended supply chain network. In an outsourced environment, it must provide design and manufacturing partners and suppliers selective and secure access to a single version of a product record, any time and anywhere. To maximize return on investment, it must bridge design tools and ERP systems without adding significant IT complexity and cost. BOMControl has been created with these objectives in mind.

### About BOMControl

Over 500 companies from diverse industries have been using BOMControl to revolutionize the way they manage their product information, including bills of materials. Customers include Invisalign, GoPro, Digital Lumens, Speck, Cisco, Sonos, Yakima and Square. These companies have been able to:

- Significantly accelerate product time to market.
- Greatly improve collaborative outsourced partnerships.
- Confidently meet compliance requirements.

Thousands of users from these companies as well as their partners and suppliers have used BOMControl to access a “single version of truth” of product information and project details—including design files, BOMs, items, costs, vendor information, ECOs, compliance status, schedules and tasks—anytime and anywhere. The benefits they have experienced include:

- BOMs and associated data are more accurate.
- ECO cycle time and overall product ramp time are reduced.
- The ability to manage across multiple BOMs and their associated data helps increase part re-use and reduce cost.
- Companies and supply chain partners are able to collaborate earlier in the design process.
- Product cost visibility in the design phase, when at least 70% of a product’s cost is built in, enables the management to make trade-off decisions and reduce overall product cost.
- Contract manufacturers are able to eliminate incorrect builds and obsolete and excess inventory.
- Companies are able to streamline product compliance management from initial BOM throughout the product lifecycle, with instant compliance reporting capability and audit trails.

Because BOMControl is a cloud product, companies as well as their outsourcing partners and suppliers can access the solution and work collaboratively with just a web browser and Internet connection. BOMControl eliminates the need for companies to acquire new hardware, software, or additional IT staff. Moreover, customers can add unlimited number of users across their supply chains and selectively allow them to access product information and project details.

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