

# The Four Critical Questions Answered

### QUESTION 1: RELEVANCE OF MRP

Is manufacturing requirements planning (MRP) still relevant in an industrial world obsessed with supply-chain management and enterprise resource planning (ERP)?

At the core of every MRP application is the calculation designed to tell companies what they have, what they need to make and buy, and when they need to make and buy it. If this were the only definition for MRP, then the answer to this question would be obvious. MRP may not be perceived as leading edge at this time, but accurate answers to the simple questions of what a company has, what it needs to make and buy, and when it needs to make and buy it can spell the difference between success and failure for any company. When taking into account the increased complexities in the twenty-first century, the failure to answer these questions accurately will cause a company to fail more quickly. In this case, “failure” is not necessarily bankruptcy. It is often a difficult middle ground where some companies perpetually teeter on the brink without actually failing, whereas others are also-rans that never can break their way into sustained growth.

In reality, MRP is critical and more relevant than ever. Unfortunately, the truth is that the core MRP concepts and rules around them have been neglected and left to stagnate for a long time. In addition, there is a complete lack of understanding that this stagnation is even a problem. Many newer operations approaches even advocate abandoning MRP completely. Some lean and theory of constraints (TOC) implementations measure their success by unplugging the formal MRP system.

In the last 50 years, there has been a revolution in logistics costs and management. Consider that the first container ship was introduced in 1955. The cost to load one ton of cargo in 1955 was \$5.86.<sup>1</sup> Today, the cost to load one ton of cargo in a shipping container is 16 cents. At the same time, communication technology has evolved dramatically. In 1915, Bell’s first transcontinental call from New York to San Francisco took 23 minutes to

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<sup>1</sup> Intermodal Steel Building Units, American Association of Port Authorities.

connect using five intermediary operators. The first self-dialed long-distance call in the United States took place on November 11, 1951.<sup>2</sup> Today, the Internet and 4G cellular and satellite-enabled phones make communication instantaneous almost anywhere in the world. In the last 20 years, there has been significant attention and emphasis from the software companies on developing supply-chain solutions from both methodologic and technological perspectives. The development of these highly integrated systems has enabled a revolution in distribution and logistics between consumers and suppliers. Information about distribution and logistics is no longer a limitation worldwide. Now it can be well known what items were sold, when items move, and where those items are at any point in time. A logistics company can provide real-time updates as parts move around the world. However, at the heart of any supply chain is manufacturing.

In most supply chains, there are several different manufacturing sites and processes that must be coordinated and synchronized effectively to bring a finished item into the distribution pipeline.

At the heart of every supply chain is manufacturing. At the heart of manufacturing is MRP. In an attempt to understand supply chain many writers have simplified the supply chain structure into a straight line. However, supply chains are not the simple linear structures normally represented as the supplier's supplier to the customer's customer. Supply chains are web-like entities that are difficult to represent graphically. Each company is linked to several other companies depending on the product and the customers. These linkages and relationships change as market conditions change. Information flows across and throughout this web. The heartbeat for that information is the MRP system. Each node in the web is a different MRP system. An excellent graphic representation of a supply chain is the cover of this book. Therefore, a primary limitation of any supply chain will be how well MRP systems perform not just individually on each node but also collectively throughout the web. Simply put, MRP has more impact on and is more relevant to the effectiveness of today's supply chain than ever before.

A previous challenge within supply chain management was not having visibility into what is being moved and its status; now warehouse management and logistics tools have solved that problem. Now the problem is fundamentally about which specific items are actually being moved, transported, located and made. What gets put on lathes, welding jigs, assembly lines, trucks, boats and airplanes is a response to a demand or supply order generation signal.

Today, due to the increasing complexity of the global manufacturing and supply landscape the supply order generation signals that move down through our supply chains have become more and more out of alignment with actual demand.

The traditional planning rules and tools (including forecast based demand generation) employed by most manufacturers and distributors do not fit the highly volatile and variable world we live in. Those rules were constructed under a "push and promote" mentality fueled by production efficiency metrics and a market that was more tolerant of longer lead times and shortages.

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<sup>2</sup> Compiled by John Loucks from Synergy Resources.

In order to get smarter and more agile supply chains, we must take a fundamentally different approach where demand is at the center of planning and not inventory. This is not just about speeding up what we already have.

## **QUESTION 2: MRP—FLAWED APPROACH OR POORLY APPLIED?**

Is MRP failing in today's environment because it is inherently flawed or because it is poorly implemented?

The case can be made that MRP is both a flawed approach and an approach that has been poorly applied. MRP has many well-known shortcomings, and it is commonly implemented and/or supported in an inadequate fashion. Frequently, there are finger-pointing matches within companies about which is the real problem. The truth is that both are reality. MRP has critical shortcomings and often is implemented and supported poorly. Fixing only one issue will not improve the situation dramatically. Thus companies that "reimplement" MRP do not get the fix they were expecting or leave a lot of possible benefit on the table without realizing it.

The result of MRP's shortcomings and/or poor implementation is that companies have chronic and frequent shortages at various stages of the production, procurement, and fulfillment cycles. These chronic and frequent shortages tend to lead to three main effects:

1. *Unacceptable inventory performance.* This is identified as having too much of the wrong material, too little of the right material, high obsolescence, and/or low inventory turns. Companies frequently can identify many of these problems at the same time.
2. *Unacceptable service-level performance.* Customers continue to put pressure on the company, which quickly exposes poor on-time delivery, low fill rates, and poor customer satisfaction. In addition, customers consistently attempt to drive prices down.
3. *High expedite-related expenses and waste.* In an attempt to fix the preceding two unacceptable business results, managers will commit to payment premiums and additional freight charges or increase overtime to fulfill promises. Typically, this effect is undermeasured and underappreciated in most companies.

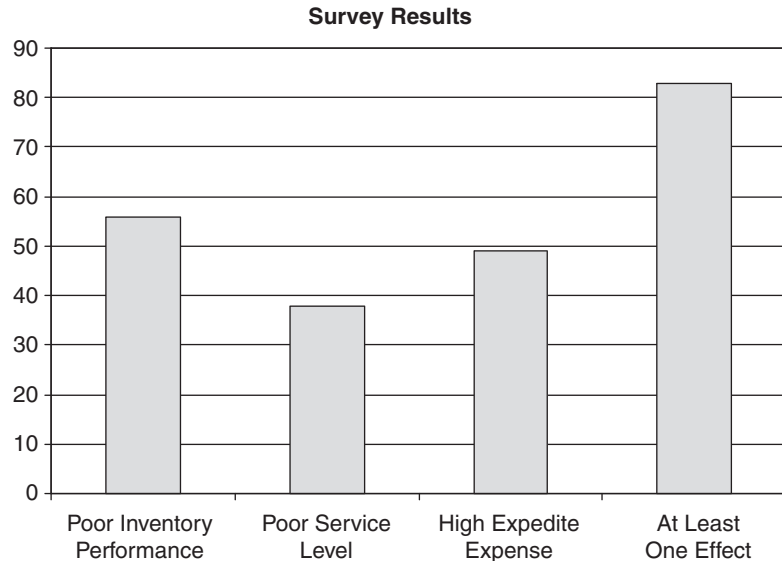
As research for writing this book, we surveyed over 150 companies about their materials planning systems. While a minority of companies reported all three of these effects simultaneously to a severe degree, 83 percent of companies reported at least one of these effects to a severe degree over a period of multiple years. Figure 3-1 presents the results of the survey.

To address these undesirable effects, the shortcomings inherent in conventional MRP must be fixed, and the MRP system must be implemented and supported properly. Only one part of the solution is not sufficient.

MRP is defined as:

**FIGURE 3-1**

Survey results.



**material requirements planning (MRP):** A set of techniques that uses bill of material data, inventory data, and the master production schedule to calculate requirements for materials. It makes recommendations to release replenishment orders for material. Further, because it is time-phased, it makes recommendations to reschedule open orders when due dates and need dates are not in phase. Time-phased MRP begins with the items listed on the Master Production Schedule (MPS) and determines (1) the quantity of all components and materials required to fabricate those items and (2) the date that the components and material are required. Time-phased MRP is accomplished by exploding the bill of material, adjusting for inventory quantities on hand or on order, and offsetting the net requirements by the appropriate lead times.<sup>3</sup>

Known shortcomings in conventional MRP are summarized in Figure 3-2, with the effect resulting from the shortcomings identified.

These shortcomings are nothing new to MRP users. The rapidly changing environment of global manufacturing and the global supply chain is exacerbating these effects and putting increased pressure on MRP systems and planning personnel.

The continued quest for forecast accuracy has led to the development of improved forecasting algorithms and sophisticated technology dedicated to forecasting. However the surprise is that even with all this improvement and sophistication, the overall accuracy of the forecast has not improved dramatically. Increased volatility in the market has offset any gains in methodology. In addition, any realized improvements in forecast do not translate to overall improvements in customer service and inventory levels. This was

<sup>3</sup> *APICS Dictionary*, 12th ed. (New York: Blackstone, 2008) p. 81.

**FIGURE 3-2**

MRP shortcomings and their undesirable effects on organizations.

Typical MRP Attributes		Effects to the Organization
<b>Planning Attributes</b>	MRP uses a forecast or master production schedule as an input to calculate parent and component level part net requirements.	Part planning becomes based on a "push" created by these forecasted demand requirements. Forecast accuracy at the individual sku and part levels is highly inaccurate. Build Plans and POs that are calculated from this forecast often are misaligned with actual market demand. This leads to excessive expediting, overtime, premium freight, increased inventory of the wrong items and missed shipments.
	MRP pegs down the <i>entire</i> Bill of Material to the lowest component part level whenever available stock is less than exploded demand.	Creates an overly complicated materials and scheduling picture that can totally change with one small change at a parent item. When capacity is scheduled infinitely there are massive priority conflicts and material diversions. When capacity is scheduled finitely across all resources there is massive schedule instability due to cascading slides from material shortages.
	Manufacturing Orders are frequently released to the shop floor without consideration of component part availability.	Manufacturing Orders are released to the floor but cannot be started due to shortages. This leads to increased WIP, constantly changing priorities and schedules, delays, lots of expediting and possibly overtime.
	Limited future demand qualification. Limited early warning indicators of potential stock outs or demand spikes.	Planners either have to bring in all future demand which inflates inventories and wastes capacity and materials or bring in no future demand, which makes the environment extremely vulnerable to spikes or must pour through large amounts of data in order to qualify spikes for each part.
	Lead time for parent part is either the manufacturing lead time (MLT) or the cumulative lead time (CLT) for the parent item.	MLT typically represents a gross underestimation of realistic lead time. When MLT is used, Manufacturing Orders are often released with dates that are impossible to achieve and/or without all component parts available. CLT typically represents a gross overestimation of lead time. When CLT is used Manufacturing Orders are typically released to far in advance, raising WIP levels and making the environment more susceptible to disruption when order changes occur.
<b>Stock Management Attributes</b>	Fixed reorder quantity, order points, and safety stock that typically do not adjust to actual market demand or seasonality.	Additional exposure to forecast inaccuracies resulting in increased expediting.
	Past due requirements and orders to replenish safety stock are often treated as "Due Now."	There is no way to judge relative priority between stock orders. Every safety stock order looks the same, which means there is no REAL priority. To determine real priorities requires massive attention, analysis and priority changes.
	Priority of orders is managed by due date (if not Due Now).	There is no way to judge relative priority between stock orders. Due dates will not reflect actual priorities. To determine real priorities requires massive attention, analysis and priority changes.
	Once orders are launched, visibility to those orders is essentially lost until the due date of the order when it is either present or late.	There is no advanced warning or visibility to potential problems with a critical order. Critical parts are often late and disrupt parent item schedule.

discussed in Chapter 2. The global manufacturing and supply landscape is a much more complex environment characterized by massive instability and volatility. Forecast error continues to rise despite significant investments in time and money creating more sophisticated algorithms for predicting the behavior of supply chains. There are three well-known rules of forecasting that have not changed with this investment:

1. Forecasts are always in error.
2. The more detailed the forecast, the more error will be realized.
3. The further into the future the forecast goes, the more error will be realized.

There is a legacy of make to stock manufacturing strategies that are centered on MRP and how it has been implemented traditionally. When considering today's conditions of shorter customer tolerance times with longer and more complicated supply networks, the need for holding stock at some level is a given for most manufacturers. The

manner (rules and tools) in which conventional MRP plans and manages these stock positions creates the problematic undesirable effects detailed in Figure 3-2.

Most MRP systems are driven by a master schedule driven by a forecast. This plan can be developed through an interactive sales and operations process (see Chapter 19), but it is still a best guess at end-item requirements. Using the forecast to drive requirements creates, by definition, a push-based system. This is frequently in error and conflicts with the proliferation of demand-driven or pull-based approaches, methods, and tools. Companies that use forecasting to drive MRP while at the same time using demand-driven/pull-based techniques to execute often have a push-versus-pull dilemma. This “results in a constant tension between the supply side and demand side.”<sup>4</sup> This tension creates misalignments, and the misalignments generate massive amounts of waste.

MRP is fundamentally only a planning tool. Problems tend to be identified only after they have risen to the surface. There is little or no visibility of potential problems or what constitutes the actual execution priority. This lack of visibility creates a critical gap in today’s more complex supply-chain scenarios. Companies are now beginning to realize just how important this type of visibility is. A survey of 209 companies in 2009 by the Aberdeen Group concluded that:

... 57 percent of respondents indicated that Supply Chain Visibility (SVC) was currently a high priority for improvement with an additional 28 percent indicating it was a medium priority. Increasing visibility is a critical strategy for enterprises aimed at reducing costs and improving operational performance in the context of their complex and multi-tiered global supply-demand networks.<sup>5</sup>

Most experienced planning personnel are not blind to the shortcomings of MRP. These have been discussed for years at APICS meetings. However, these shortcomings have been further exacerbated by the variability and volatility of today’s hypercompetitive and hypersensitive environment. Materials and production control personnel often find themselves in a dilemma regarding their MRP system. There are powerful aspects of MRP that are still relevant and necessary. The need to be able to plan complex product structures across a complex supply chain well in advance of customer demand means that some aspects of MRP are even more relevant today than when they were conceived 40 years ago. Companies desperately need visibility within today’s more complex planning scenarios.

At the same time, using MRP does not provide the flexibility to be responsive to actual market requirements and consumption. Ignoring these shortcomings has disastrous consequences in today’s environment. Every person faced with materials planning under these circumstances is forced to find various, often unsatisfactory and incomplete

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<sup>4</sup> Aberdeen Group, “Order-to-Delivery Excellence: Linking the Demand Chain with the Supply Chain,” Boston, 2009, p. 1.

<sup>5</sup> Bob Heaney and Viktoriya Sadlovska, *Supply Chain Visibility Excellence; Reduce Pipeline Inventory and Landed Cost* (Boston: Aberdeen Group, 2009), p 4.

ways to sidestep these shortcomings. The typical compromises used to work around these shortcomings include

- Manual work-around proliferation
- Attempts at more efficient forecasting
- Manual reorder point systems
- Overflattening the bill of materials
- Move to a make-to-order (MTO) model
- “Dumbing down” MRP

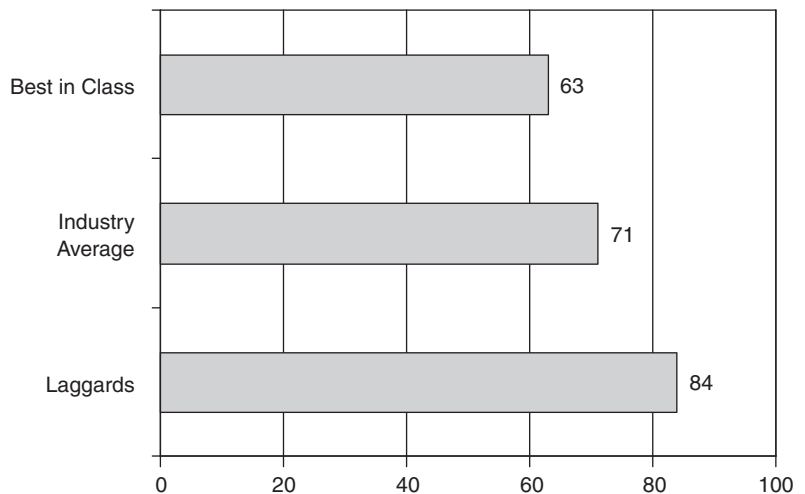
### Manual Work-Around Proliferation

Frequently, companies try to work around the shortcomings of their MRP system by relying on stand-alone, disconnected, and highly customized data manipulation tools such as Excel spreadsheets and Access minisystems. Data are taken from a core MRP tool and then manipulated by an individual. Typically, this individual is the one who actually built the sheet or minisystem and, consequently, usually is the only one who knows how to use it. From a risk-mitigation standpoint, this is unacceptable. The company’s ability to plan and execute against those plans can be crippled by the loss of this individual. These tools have serious limitations, and their proliferation makes the information technology (IT) landscape more complicated and maintenance more intensive. Their widespread use ultimately defeats the purpose behind the major investment in an integrated ERP package because the information garnered is limited to the individual user. Many have called this “Excel hell.”

A recent report by the Aberdeen Group<sup>6</sup> showed just how pervasive this compromise is (Figure 3-3).

**FIGURE 3-3**

Companies using spreadsheets for demand management.



<sup>6</sup> Aberdeen Group, “Demand Management,” Boston, November 2009.

In a survey of 135 companies,

- 63 percent of the best-in-class (top 18 percent) companies reported that they used spreadsheets for their demand management.
- 71 percent of the industry average (middle 54 percent) performers reported the use of spreadsheets for demand management.
- 84 percent of laggard companies (bottom 28 percent) used spreadsheets.

Consistent with the Aberdeen Group survey is a survey from [www.beyondmrp.com](http://www.beyondmrp.com) regarding this strategy of MRP-related compromises (Figure 3-4). The results of these two surveys suggest that for most companies there is a basic lack of trust that MRP is providing an accurate picture of what is required and when it is required. Additionally, these reports are an indicator of the inability of ERP companies to evolve MRP rules and tools to an acceptable level or their ambivalence about such an evolution.

**FIGURE 3-4**

[beyondmrp.com](http://beyondmrp.com)  
survey results.

Do employees develop “work-arounds” using spreadsheets and Access databases (for example) because they feel they can’t work effectively within the formal planning system?



### More Efficient or Better Forecasting

Other companies have pursued a strategy of investing in and implementing advanced forecasting algorithms or hiring more planners in the hope of guessing/predicting better. Remember the three well-known characteristics of forecasting:

1. Forecasts are always in error.
2. The more detailed the forecast, the higher is the rate of inaccuracy.
3. The further into the future the forecast is extended, the higher is the rate of inaccuracy. This inaccuracy is even worse when the granular (stock keeping unit or part number) level is considered.

These characteristics are particularly true today, considering the increasing amount of variability, volatility, and complexity across the supply chain. In the best of times, the improvements in forecasting rarely correlated with improvements in the overall quality of the plan. When the acceleration of volatility and complexity is considered in today’s supply chain, the offsetting advances in forecasting algorithms and technology are inad-



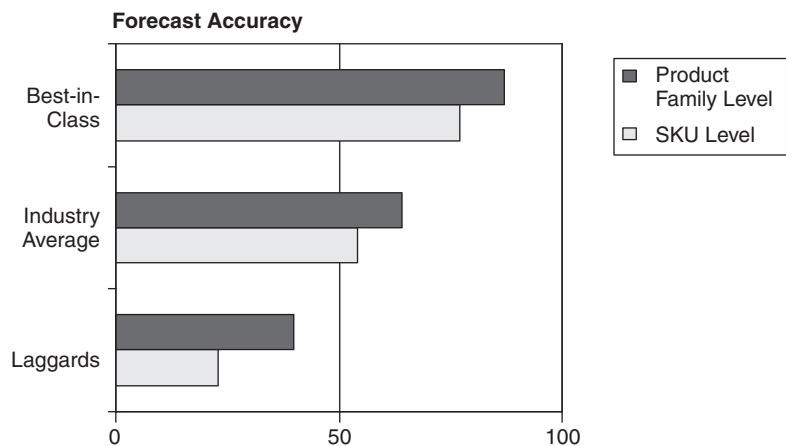
equate to improve the planning process. The same Aberdeen Group report<sup>7</sup> also noted that 57 percent of the companies it surveyed responded that they have consistently inaccurate forecasts. Additionally, the report demonstrated how forecast “accuracy” breaks down with more detail. Best-in-class companies reported 87 percent accuracy at the product family level, but at the stock keeping unit (SKU) level, accuracy dropped to 77 percent. Industry average companies reported an accuracy of 64 percent at the product family level and 54 percent at the SKU level. Finally, laggards reported 40 percent accuracy at the family and a dismal 23 percent at the SKU level. Figure 3-5 depicts this breakdown.

Even if a company succeeds in increasing signal accuracy, it does not necessarily translate well to overall effectiveness in terms of availability and fill rates. Remember, the increase of variability and volatility, especially on the supply side, easily can offset any appreciable gain in signal accuracy. Most manufacturers have multiple assembly and subassembly operations that are integral parts of their overall end-item product flow. In any type of assembly operation, it takes the lack of only one part to block a complete shipment. The more assemblies that exist, the more complex is the synchronization and execution challenge. Companies that experience this phenomenon usually compensate with additional inventory rather than risk unacceptable customer service.

Even the biggest supporters of advanced forecasting algorithms cannot argue that forecasts and any purchasing and manufacturing schedules derived from them aren’t still a push-based tactic. The recent statistical advancements may make it a more educated push, but it remains a push nonetheless. For companies implementing demand-driven or pull-based manufacturing execution systems (e.g., lean or drum-buffer-rope [DBR]), this sets up conflicting modes of operation. This conflict is the push-versus-pull conflict referred to earlier.

**FIGURE 3-5**

Company category and percentage of those responding on forecast accuracy at the product family and SKU levels. (From Aberdeen Group, “Demand Management,” Boston, November, 2009.)



<sup>7</sup> Aberdeen Group, “Demand Management,” November, 2009.

Forecasting assumes that the future will look like the past. Past demand is input into sophisticated forecasting algorithms to project the future. This can be compared to driving a car by only using the rear view mirror. If you are driving on a straight road where the road in front looks like the road behind, then you may be successful. However if you are driving on a road with many twists and turns, the results can be catastrophic. Business today has to face more twists and turns than ever before.

## Manual Reorder Point Systems

In order to overcome the shortcomings of MRP, some companies and many lean disciples have abandoned MRP completely. Early demand flow implementations actually had lapel buttons with the letters “MRP” and the universal “not” sign over them, as demonstrated in Figure 3-6. In its place, the pull-focused companies have implemented different forms of manual reorder point systems.

Manual reorder point systems were a common technique for managing inventory before MRP. Has industry come full circle? Is industry ready to abandon the promise of technology just because an antiquated set of rules and tools has not been updated or evolved?

Consider what Joe Orlicky himself said about reorder point systems in the first edition of this book in 1975:

Systems based on reorder point suffer from false assumptions about the demand environment, tend to misinterpret observed demand behavior, and lack the ability to determine the specific timing of future demand. These shortcomings, inherent in all systems of this type, manifest themselves in a number of unsatisfactory performance characteristics, chief among them being an unnecessarily high overall inventory level, inventory imbalance, and stock-outs or shortages by the system itself.<sup>8</sup>

**FIGURE 3-6**

Lapel button used by early demand-flow and lean advocates.



<sup>8</sup> Joe Orlicky, *Material Requirements Planning* (New York: McGraw-Hill, 1975), p. 6.

Probably the best example of a modern-day manual reorder point is the frequently used lean technique of *kanban*:

**Kanban (lean stock technique):** A method of Just-in-Time production that uses standard containers or lot sizes with a single card attached to each. It is a pull system in which work centers signal with a card that they wish to withdraw parts from feeding operations or suppliers. The Japanese word *kanban*, loosely translated, means card, billboard, or sign, but other signaling devices such as colored golf balls have also been used. The term is often used synonymously for the specific scheduling system developed and used by the Toyota Corporation in Japan.<sup>9</sup>

Today, many researchers and practitioners make the same comments about kanbans that Orlicky made about the manual reorder points of his day. Kanbans tend to be manually intensive, lack responsiveness to changes in the environment, limit planning visibility, and force an unnecessary and wasteful level of independence into the manufacturing environment. This is not meant to say that kanbans do not have a time and a place in modern manufacturing. The time and the place, however, are not “always” and “everywhere.” Manual reorder points and kanbans are supplementary tools at best.

After years of experience in implementing kanban systems and heijunka board in a variety of industry, it is clear that as the number of parts and components grows the manual systems become increasingly difficult to manage. Kanbans are very easy to establish and begin to use. However, when the company grows to any significant size, the overhead to manage kanbans can quickly become overwhelming. The number of kanbans can quickly grow to the hundreds. Reconciling the number and location becomes a substantial task with a great deal of complexity. This is problematic for most midrange or larger discrete manufacturers. Early adopters of lean were emphatic that technology was a waste to be totally eliminated. The desired future state was one where the part would move only when pulled by the next station. However the gremlins of variability made the necessity of technology quickly apparent. John Constanza, the founder of JCIT, developed the first demand flow software to support lean. The technology was very different than the MRP systems of the day. Early adopters struggled with how to manage the sheer number of kanbans and how to trigger unique configurations. Even the first demand-flow visionaries developed software to support their approach.

Rarely are kanbans realigned with the actual demand variation owing to the overwhelming nature of completing that task. Kanbans almost always omit independent demand, including service and repair. In addition, kanbans provide no forward planning because they are a reactive pull signal assuming that the immediate future will look like the past. Few suppliers are agile enough to support a company without some forward planning. This can mean that suppliers add extra inventory for this unexpected demand or reduce the variety that can be offered to customers. Manual reorder points are even less effective in larger organizations. When an organization must plan across a large

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<sup>9</sup> *APICS Dictionary*, 12th ed. (New York: Blackstone, 2008), p. 70.

enterprise, particularly a vertically integrated enterprise, it is left with few viable and satisfactory options.

Some software has been developed as an aid to reduce the complexity of managing kanbans. This software reduces the management burden and enables the company to adjust kanban sizing. However, all electronic software products lack the ability to provide the critical available inventory and netting picture that more complex manufacturing situations require.

**available inventory:** The on-hand inventory balance minus allocations, reservations, backorders, and (usually) quantities held for quality problems. Often called beginning available balance.<sup>10</sup>

These are the necessary traditional MRP functions that have been abandoned in the lean world. Simply knowing the stock on hand and on order cannot provide the complete picture of what to order unless those two positions are also considered in relation to relevant demand allocations. An accurate available stock equation is not possible with manual or even electronic reorder point systems such as kanbans. The lack of visibility means that organizations of size or even moderate complexity are flying blind to the overall materials and inventory picture. The available stock equation will be discussed in depth in Part 4.

Furthermore, manual reorder points and kanbans do not consider the bill of material in its totality. The kanban is defined only at each discrete connection. This means that stock positions often must be placed at every position in the bill of material. This strategy, in turn, increases the number of stocked positions to manage and potentially raises total inventory. Often the implementation of kanbans is not limited to only each connection in the bill of material. Organizations frequently place them between each step in the routing. When there is a larger number of part numbers with sporadic demand or relatively long routings for many part numbers, inventory can rise dramatically.

*Author's note:* The preceding section on manual reorder points and kanbans is not intended to alienate the lean advocate. Its intention is to highlight accepted realities about the planning limitations of manual and even electronic reorder point positions/systems in environments of size and relative complexity. Many environments do apply kanbans successfully, especially when those kanbans are placed in the right positions.

## **Overflattening the Bill of Material (BOM)**

Sometimes companies try to simplify the synchronization issue by dramatically reducing the number of levels in the BOM. In many cases, reducing BOM complexity makes sense. Taken to extremes, it can close more doors than it opens. Flattening the BOM removes levels that were identified originally to define the product and the process. These dependencies provide an excellent way to stop variability from gaining momentum and disrupting the entire supply chain like a tsunami. The key to better synchronization is to

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<sup>10</sup> *APICS Dictionary*, 12th ed. (New York: Blackstone, 2008), p. 8.

understand those dependencies and control them. By overflattening the BOM, companies can actually lose visibility at both the planning and execution levels. Some companies have had to reinsert a level in their BOMs in order to gain back critical leverage and decoupling points. This will be discussed at length in Chapter 23.

### **Move to a Make-to-Order (MTO) Model**

Some companies will attempt to address the forecasting issue by eliminating it totally and any finished end-item positions entirely. This is possible only with a pure MTO strategy. Referring back to the Wheelwright and Hayes product/process matrix in Figure 1-2, this strategy is effective only in a job-shop environment that supports high-variety, low-volume production. Attempting to use this strategy for low-variety, high-volume production will spell disaster for the company as costs spiral out of control. Companies that can employ this strategy will need carefully placed and controlled raw material and component stock positions in order to stay competitive in terms of lead time and cost. Part 4 of this book will provide more detail.

### **“Dumbing Down” MRP**

Finally, companies will “dumb down” the MRP system by eliminating some of the integrated nature of its planning. The power of this technology is the rapid calculation of requirements across complex interrelated BOMs. MRP at its core minimizes inventory by planning only items that are needed when they are needed. By dumbing down the system, those interrelationships and that precise timing are lost. The balance of this book will discuss the necessary conditions for an effective material planning system in a demand-driven environment.

## **QUESTION 3: THE MRP CONFLICT WITH LEAN OR PULL**

Why do lean and other pull methodologies often come into conflict with MRP?

In addition to the rise in volatility and complexity referred to earlier, the proliferation of lean philosophies has put additional pressure on planning personnel and MRP systems. The fundamentally different view of what is important in relation to inventory puts lean advocates and planning personnel at odds. Many lean implementations attempt to abandon MRP. This causes tremendous friction between planning personnel and those pushing for that abandonment. Lean facilitators often see MRP as an overly complex and wasteful dinosaur that simply doesn't work in the demand-driven world. Planning personnel, however, see it a completely different way. They understand that without the ability to see the total requirements picture, critical blind spots then exist in the planning process that lead to shortages and/or even excessive inventory positions. They see the lean approach as a gross oversimplification of the complex scenarios that are the “new normal.” There are three conflicts that tend to occur between lean and MRP.

## Conflict 1: Planning Versus Execution

As discussed earlier, MRP is, by definition, a planning tool. MRP launches orders based on a combination of data pertaining to demand, on-hand, open-supply, BOM, and lead-time parameters. It assumes that a system of execution is in place to manage to the plan. MRP detractors cite the frequent poor quality of the plan as a reason that makes effective execution impossible and even counterintuitive. Worse, those detractors say that if organizations did in fact execute to the plan, it would be disastrous and result in shortages and service-related problems.

Thus, if the planning system cannot provide a realistic, feasible plan that delivers materials as the market needs them, many lean advocates would recommend that we abandon planning altogether. In their mind, planning often becomes relegated to some initial assumptions about the rate of demand pull, takt time, decoupling BOMs, and routings at most discrete part numbers and steps, respectively, and allowing resources (including suppliers) to “read and react” in order to fulfill materials requirements. In effect, there really is no planning after the initial setup, only execution.

## Conflict 2: Complexity Versus Simplicity

MRP advocates desire a solution that identifies and manages the inherent dependencies in manufacturing situations. In order to do this, MRP can be a highly complex system to operate. As mentioned in relation to conflict 1, the perceived need for predictability drives companies into massive complexity. Most people in manufacturing companies don't even fully understand what the planning system is or does. Furthermore, “fixing” the system seems to be a never-ending, intricate, and expensive journey. Einstein once said, “Any intelligent fool can make things bigger and more complex. It takes a touch of genius—and a lot of courage—to move in the opposite direction.”

Einstein also said something else relevant to this conflict. He said, “Everything should be made as simple as possible, but not simpler.” Lean advocates are seeking simplicity in a solution. The tactics tend to be manual and visible. There is nothing wrong with simple solutions—to a point. When things get oversimplified, however, the end result often can be as poor as the complex side of things. *Oversimplification* is defined as “to simplify to the point of causing misrepresentation, misconception, or error”<sup>11</sup> By failing to depict and account for critical dependencies and/or relationships with regard to supply, demand, on-hand inventory, and product structure, lean can oversimplify many environments. The more complex and variable these environments, the more likely it is that lean is an oversimplified approach.

MRP's complexity, combined with its critical inherent shortcomings and lean's total oversimplification, often has the same effect—chronic and frequent shortages and at the same time excessive inventory positions. The solution must provide both a level of

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<sup>11</sup> [www.thefreedictionary.com](http://www.thefreedictionary.com).

sophistication that can provide more visibility from a planning and execution perspective and at the same time simple, clear, and highly visible signals across the enterprise.

### **Conflict 3: Dependence Versus Independence**

This is a subtle but very important conflict to understand and is an extension of conflict 2. The solution to this conflict defines a huge innovation and leap forward for MRP logic. MRP is fundamentally about making everything dependent (see Part 2). Lean's answer to the material planning puzzle is to promote complete independence. When everything is dependent, the resulting picture can be very nervous (see Chapter 2 for a discussion of system nervousness). When everything is independent, visibility is limited to what is immediately in front of you. The solution to this conflict provides for planning and execution support for the demand-driven world in more complex operational environments. See Part 4 for a discussion of demand-driven MRP.

While these conflicts continue to rage inside manufacturers, lean advocates are beginning to understand the need for an effective technology solution. When it comes to materials and inventory planning and execution Lean advocates often get accused of being anti-technology. Do Lean advocates really want manufacturing companies to entirely abandon the promise of technology? The answer should be yes when that technology is wasteful, confusing and not reflective of reality. Unfortunately, that has been the situation for quite sometime with regard to traditional MRP and DRP systems. Point 8 of the Toyota Production System states: "Use only reliable, thoroughly tested technology that serves your people and processes."<sup>12</sup> Until now the prevailing materials and inventory planning and execution technology, while thoroughly tested, has been largely inappropriate to serve the people and processes in companies transforming to a demand driven approach. The proliferation and sustainability of Lean implementations has been negatively impacted by the lack of appropriate supply chain materials planning and execution technology.

Several analyst reports have concluded that there is tremendous potential for the incorporation of better planning and visibility software into Lean implementations. Manufacturing needs Lean to survive in the more complex environment of the 21st Century. Lean needs an effective demand driven materials requirements planning approach to bring that vision to reality.

What if there was an appropriate technology? What if a reliable, thoroughly tested blueprint for demand driven planning and execution of supply chain materials with high degrees of visibility could be introduced to the MRP world? Furthermore, what if that blueprint also was extremely appealing to the MRP World? Sound impossible? It's not; it is reality and it is producing significant results in short periods of time for early adopters.

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<sup>12</sup> Liker, J. *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*. McGraw-Hill Companies, Inc., 2004.

Manufacturing needs lean and the other pull-based methods to evolve in the “new normal.” Lean needs an effective demand-driven planning approach in order to bring that evolution to reality.

## **QUESTION 4: MRP PROGRESS IN THE LAST 30 YEARS?**

Why has MRP not progressed significantly in the last 30 years?

Software providers, consultants, and the academic community have had ample opportunity to fix MRP’s shortcomings. Why have they failed?

There are many knowledgeable experts in demand-driven techniques such as lean and drum-buffer-rod (DBR). Unfortunately, many of these experts do not understand the role planning technology must play to bring those techniques to full realization across a complex enterprise and supply chain. Many of them advocate the elimination of technology as the true measure of success.

Experts in variability and volatility tend to be less enterprise-focused and more specific-event-focused. Variability must be considered in relation to its impact across a holistic system. All variation does not have the same impact. Reducing variability does not necessarily improve the overall process. There are places where it must be protected against in order to keep the system stable and effective.

The generation that developed MRP is all but lost. Most people who still have an in-depth knowledge of how MRP really works are not in software companies or academia—they are seasoned planners working in private industry. Even some of the largest ERP software companies have only a small number of people (sometimes only two or three in the largest ERP providers) who truly understand what MRP is and how it works. Rarely does even the largest provider have software developers with any real-world experience using the tools they are building. The big ERP software companies cannot and will not solve a problem they cannot see. This is evidenced by the fact that none has addressed the core issues identified in this section. The proliferation of planning work-arounds proves this.

But there is light at the end of the tunnel. At the time of this writing, we know of several next-generation products that will allow for extremely flexible and unfettered configuration in alignment with the recommendations in Part 4. This is not enough, but these products do remove hard-coded restrictions that have hampered MRP users in the “new normal.”