

How To Choose A Right-sized Manufacturing System

Chapter 1 - What do I want to accomplish?

Explore the first great conversation you should have with yourself, your accountant, or your computer consultant in the process of finding a manufacturing control system that will fit your needs and budget.

The First Question

If you are like a lot of people, your first inquiry into the world of manufacturing software will likely be prompted by reading a whitepaper entitled something like “Double Your Profits By Going Lean” or “Get Total Control of Your Manufacturing In Just 60 Days” discussing some esoteric subject of manufacturing control. Attention grabbing headlines such as these are the darlings of editors bent on propping up pageviews. But, as you might expect, they never tell the whole story.

If you have a good relationship with your accountant or systems consultant, he or she may be the first to call you by saying “I read this article...I think we should look into getting some manufacturing software.” The accountant or consultant may have done some quick search of the Internet and have the names of a number of products they want you to investigate further. Product literature and demos are readily available online.

My recommendation at this point is to adopt a “go slow” approach and invite the consultant in for a discussion of your perceived needs and desired benefits. If the consultant is willing to offer free advice, then you should accept it.

When the meeting takes place, your consultant will likely plunk a handful of literature down on your desk and tell you about the one product he or she thinks looks most appealing. Rarely will the consultant come to the meeting with an unbiased point of view – or pose the most important question of all: “So, what do you want to accomplish?”

Many software developers rely on the influence of accountants and consultants in order to generate sales. Even if there is no business relationship between the consultant and the software firm, expect your consultant to exclaim about some whiz-bang feature they saw in an online demo. The “go slow” part of this phase of your inquiry keeps pointing back to “exactly how will that feature affect my business.”

Whether or not the consultant is successful in transferring their unbridled enthusiasm to you, the bottom line for your business is finding ways to increase the effectiveness and profitability of your manufacturing operation. It is time to put the literature aside and ask the hard question over and over again “So, what do I want to accomplish by implementing a manufacturing control system?”

Don’t be satisfied with sweeping generalities such as “control my inventory” or “get a bar coding system.” You must compile a very specific list of objectives – ones that can be accomplished in the context of the resources available to you.

A common objective, and a very achievable one, is to reduce your inventory holding costs. If you are sitting on an inventory of raw materials and WIP worth, say, \$10,000 then shaving off 20% of that is only going to net you \$2,000. At that rate, you’ll need several years to pay off a manufacturing software system costing \$5,000.

On the other hand, if your inventory is worth closer to \$1M, then paying \$40,000 to reduce your inventory holding costs 20% is something you should have done yesterday!

Finding a “Right-sized” Solution

In the marketplace you will be able to find manufacturing software that costs just a few hundred dollars, manufacturing software that costs thousands of dollars, and manufacturing software that costs hundreds of thousands of dollars.

Is there a solution that fits both your needs and your budget? Most certainly, but finding it may require no small effort digging through hundreds of websites and sitting through product demonstrations.

Then how do you recognize a right-sized system?

Well, in general, you get what you pay for. Low cost software is often authored by small companies with just one or two programmers and support personnel. The makers of big, expensive manufacturing software will fly in their team of sales engineers, systems analysts, and support personnel. Somewhere between these extremes is a company and a software product that is right for your firm.

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Chapter 2 - Types of Manufacturers

If you have been busy manufacturing for any time, there is a good chance you have never taken a quiet moment to sit down and reflect on the type of manufacturing company yours has evolved to be.

The reason this understanding is important is that the function set provided by one software package or another is often heavily weighted to a particular type of manufacturer.

Here is a list of the types I have worked with over the years:

Assembler

Generally takes a number of pre-assembled units and joins them together to meet the needs of a specific customer. Rarely does any original design, engineering, or procurement.

Make to stock manufacturer

Procures and stocks raw materials which are used to build sub-assemblies and top-level assembled items. These items are kept on hand to fulfill sales orders for standard products.

Make to order manufacturer

Procures and stocks raw materials which are used, in combination with other products, to build sub-assemblies and top-level assembled items needed to fulfill a specific sales order. Top-level assembled items are never kept on hand, although commonly used sub-assemblies may be inventoried when fast turn-around is required.

Custom manufacturer

Procures and stocks raw materials and sub-assemblies which are used in a customer-driven configuration. Sub-assemblies may be standard products used in a custom configuration, or variations of standard products modified to meet customer requirements.

Job shop

Generally makes one-off products following a customer specification for which no standard bill of material exists. Raw materials are often provided by the customer. Rarely does any original design, engineering, or procurement.

Process manufacturer

Performs some discreet process on a specific raw material such as cutting, bending, folding, forming, mixing, grading. Rarely does any original design, engineering, or procurement. Sub-assemblies are rarely identifiable.

By listing these I do not intend to imply that these are the only types of manufacturers. These are simply the most common one.

Now re-read the list. As you do, you will probably identify with one type more than the others, but quite possibly by more than one of these types.

Manufacturing software products are often geared more toward one type of manufacturer than another, so reflecting on the type of manufacturer you are, and identifying with one or more types, will help direct you toward the right kind of software.

This exercise in introspection, combined with your soul-searching of “What do I want to accomplish?” in the previous chapter are important first steps in the process of choosing a right-sized manufacturing system.

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Chapter 3 - Identifying Specific Objectives

Back in Chapter 1 we posed the first great question you should ask when trying to choose a right-sized manufacturing system: “What do I want to accomplish?” As you ponder this question, you should be developing a list of specific objectives such as these:

- Reduce my inventory holding costs by at least 10%
- Organize my bills of material
- Identify and eliminate obsolete raw materials
- Establish multiple sources for critical components
- Plan my production 3 to 6 months ahead
- Coordinate production with Sales
- Avoid late raw material deliveries
- Avoid purchasing material before I need it
- Know which vendors perform best
- Build only as needed
- Avoid critical item shortages
- Ease the burden of performing an annual physical inventory
- Include manufacturing activity in my company financial statements

The list of objectives won't be the same for every type of manufacturer. For example, better coordination with Sales will be critical to a Make-To-Order manufacturer, less relevant to a Make-To-Stock manufacturer, and irrelevant to a Job Shop. Tracking vendor performance may be irrelevant to a Process manufacturer, but vital to a Make-To-Stock manufacturer.

Regardless, your list of objectives will fall into three categories: objectives that will immediately affect your company's profitability, those that can affect changes that will ultimately produce measurable financial results, and those that have no financial measure but will improve your company's operations in any case.

Immediately Measurable Objectives

When compiling your list of objectives, you may focus on things that can be measured in terms of the profitability of your company. If your CFO is involved in selecting a right-size manufacturing system (and he/she should be) then the question will invariably be asked “How long will it take to pay off a system like this?”

If a manufacturing control system can help you reduce your annual inventory financing costs by, say, \$15,000, then any system costing \$14,999.99 or less will make your CFO smile. Pay-back in less than one year is a lot to ask, but systems do exist in this price range.

If you wish to evaluate manufacturing software on this basis, make sure you have up-to-date and reliable information on 1) the value of your raw materials and WIP inventory (not counting your finished goods inventory) and 2) the interest rate you pay your lender to finance this inventory.

If, through careful control of purchasing and production activities, a manufacturing system can reduce your inventory holding costs by 25% (and knowing your lender’s interest rate) you should be able to quickly calculate the potential pay-back.

In my experience, systems offering a pay-back in less than 36 months are very attractive.

Indirectly Measurable Objectives

A manufacturing company assisted by a right-sized manufacturing control system can achieve better results in less time than any company operating by the seat of its pants. Many tasks can be accomplished by software in seconds that would require many hours to complete manually.

Consider updating the cost of finished goods whenever raw material costs change (aka cost roll-up). When several levels of sub-assembly exist, this task becomes so time consuming that it is often overlooked. And yet, accurate costing of finished goods is critical to your success as a company. Software can roll up your costs in moments -- and never make a mistake.

While it is tempting to focus on inventory reduction as a justification for a new manufacturing system, I believe these indirectly measurable objectives can be far more valuable in the long run.

Impossibly Measurable Objectives

Every manufacturer knows the pain of completing production after some critical customer ship date has passed. The blame goes around and around, but the damage is done. Could you place a dollar value on a planning tool that would help you avoid such unfortunate experiences in the future?

In addition, the act of acquiring a new manufacturing control system will require many people in your plant to re-examine, re-evaluate, and re-establish policies and procedures. This reorganization, in and of itself, will be reflected an increased efficiency and profitability.

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Chapter 4 - Maintaining Perspective

If you complete the introspective steps along the path of choosing a right-sized manufacturing system, you will develop a better understanding of yourself as a manufacturer and the particular aspects of a manufacturing control system that will meet your needs.

Before you step off and start contacting software vendors about the capabilities of their products, we need to have one last heart-to-heart about what you are likely to encounter.

I remember, early in my career, starting the search for a new automobile. Newly married, we had no children at the time, and we hardly ever ventured more than 100 miles from home. Moreover, my salary as a junior designer of computer equipment put serious constraints on the kind of automobile we could afford.

As we visited one automobile showroom after another, salesmen eagerly displayed their wares, pointing out the benefits of a more powerful engine, the optional 6-speaker stereo radio, the model with more chrome, heated seats, and remotely controlled side mirrors. As an engineer, I listened and understood. I drank the Kool-aid. But soon I was thinking about purchasing an automobile twice as expensive as what I could afford.

In the end, none of these salespeople sold me a car. Instead I purchased a used car, with a more powerful engine that consumed a lot of gas, heated seats that worked mostly in the summer, and a remotely controlled passenger side mirror. Oh, and if you could receive any radio station on the car's 6-speaker stereo radio, you could surely look out the window and see the station's transmitter tower. Right-sized? Sadly, no.

Looking back, many years later, I realize this purchase decision was not one that I am proud of. But, as is so often the case, it was an instructive one. I can see that, even though I went to the market with a firm understanding of my needs and the features most important to me, I allowed well-meaning (OK, perhaps self-interested) salespeople to distract me. In the end, I failed to purchase a right-sized automobile.

Later in life, in the process of helping clients select a right-sized manufacturing system, I have observed the same conflict in action. The client starts the process with a carefully constructed list of the benefits he wants and the features he requires, only to be distracted by demonstrations of products with all sorts of wiz-bang features, but way beyond his means and needs.

Today I urge clients to consider their objectives in the context of what you think they can reasonably achieve using their available resources. A 3-person assembly house shouldn't be spending money on software that automates the Sales/Manufacturing relationship. Spending thousands to achieve a 10% reduction on inventory worth only \$10,000 doesn't make sense either. Expecting to implement new production and purchasing procedures without hiring additional staff is impractical, too.

Once you and your staff have compiled a list of manageable objectives, the next step is to determine whether any of the desired gains justify the cost of a manufacturing system.

Over the years, we've found that most justifications for the deployment of a system fall into one of three categories which we will examine starting in the next chapter of How To Choose A Right-sized Manufacturing System.

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Chapter 5 - Reducing Costs

Types of Costs

There are many costs associated with running a manufacturing operation. Some are tangible such as the cost of raw materials and production labor. Others are intangible such as the cost of placing purchase orders too late or expending more production labor than anticipated.

One of the most extreme costs of all is missing a customer ship date. Without a doubt, any system that could eliminate, or significantly reduce, the frequency of missed ship dates could easily justify itself. But who could place a dollar value on such a benefit?

Reducing Inventory Costs

One of the primary sources of cost reductions is the elimination of unnecessary inventory. If through effective planning and foresight, you could indeed reduce your inventory holding cost

by 10 or 20%, then the purchase of a manufacturing inventory control system might be justified, depending on your current inventory and finance interest rate.

Imagine that, absent any menu planning on your part, you decided to bring home 4 grocery-carts full of food each week, filling 6 refrigerators, just so you wouldn't be caught short. Similarly, manufacturing firms with no effective planning tools tend to compensate for their lack of planning by purchasing and storing a large quantity of raw materials. Either is a way to avoid unexpected shortages, but a horrible waste of cash.

Eliminating this waste can be a sufficient justification for purchasing a manufacturing system. In my experience, clients who implement an effective inventory control, purchasing, and production management system can expect to trim 20-30% off their inventory holding costs. Rather than purchasing inventory "just in case you need it" the owner of a manufacturing management system will know what to purchase, and when, in order to meet future customer demand.

To be conservative, a manufacturing firm accustomed to keeping \$1M worth of raw materials inventory on hand could free up \$200,000 by depending on the manufacturing software to tell them what to purchase and when to purchase it so that customer demands are met on time.

That \$200,000 could be used elsewhere (perhaps to purchase a new manufacturing control system) or banked. Assuming a commercial lending rate of 8%, a corresponding \$16,000 reduction in debt service – in just one year – could fund the acquisition of a right-sized manufacturing control system, including implementation costs, training, support, and on-going maintenance.

Over the years, I have been amazed at how few clients actually knew what their raw materials and WIP inventory was worth. In an initial client meeting, I always ask what the inventory is worth and make a note of the answer. Later, when the implementation is complete, I always run an inventory valuation report and compare the result with the number recorded in the notes of my initial client meeting. Almost always the actual inventory valuation is double (often triple or quadruple) what its owners had predicted.

The point can be made that inventory stockrooms, like refrigerators and pantries, tend to accumulate materials that have no immediate or continuing need. A system that can identify excess, unneeded, or obsolete inventory can justify its acquisition in just a few months of its deployment.

Now we know that many small- to medium-sized manufacturing firms don't carry \$1M worth of inventory. Depending on the products being produced and their complexity, inventory holding costs may be much lower than the \$16,000 cited above. So it may not be possible to justify the purchase of a manufacturing system based on inventory cost reductions alone. But there are

other factors that affect inventory and production costs that even the smallest of manufacturing firms must face.

Bill of Material Cost Roll-ups

Ask even the smallest manufacturing firm what their finished goods actually cost, and you will get an answer that is at best a guess.

Especially when finished goods are created from a number of raw material or sub-assembly components, it is difficult to maintain accurate costs for those goods.

The \$10 selling price of an item may have been justified when it comprised \$7 worth of parts. But when, after several years, the cost of those components has risen to \$11, selling the item for its customary \$10 cannot be sustained. There is no manual system that can maintain those costs reliably. Automatic BOM-based cost roll-up functions of a computerized system are required.

Labor Costs

For many manufacturers, the labor cost component of assembled items represents more than half of the production cost. And yet few manufacturers have anything more than a wild idea about the actual labor cost of their production.

Determining that labor cost component of your production requires analysis that few manufacturers are willing to perform. It takes time and effort to accurately measure and document the labor required to thread Nut A onto Bolt B – and to do it for every assembly operation – but the pay-off can be nothing less than extraordinary.

A client who recently implemented a manufacturing control system made the effort, somewhat reluctantly, to document the estimated labor component for each manufacturing operation. Much to his amazement, this information showed that his production cost was actually 73% higher than he thought. Using his new software to record actual production times, the client discovered that many production bottlenecks were higher than expected and labor costs more than doubled the actual item cost.

Fortunately for the client, the software was able to identify areas of extraordinary labor cost variance in time to modify production procedures and bring total costs down to within 18% of their estimated levels.

While inventory cost reduction is the primary and most obvious justification for the purchase of a manufacturing control system, enough opportunities exist to reduce total production costs that almost any type of manufacturing firm can justify the acquisition and implantation of a right-sized system.

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Chapter 6 - Basics of Planning

Planning More Effectively

It is easy to say “We should do better planning” but actually accomplishing this goal is often very difficult – virtually impossible without strict procedures coupled with a computerized system.

Effective planning is often illusive for manufacturing firms whether they are small or large, but for different reasons:

Small manufacturing firms usually lack the manpower required to “get organized” and implement sufficiently strict policies and procedures where planning is possible. Without strict procedures, small firms generally will revert to “seat-of-the-pants” operations where all efforts are focused on getting through to the end of the day.

On the other hand, large manufacturing firms have so many activities going on – engineering, purchasing, production, quality control, order entry, shipping – among people who don’t have a natural inclination to coordinate their activities, that effective planning becomes very difficult. In companies whose size would suggest that planning plays a major role in their apparent success, you may find precious little planning actually being done.

Nevertheless, great benefits can be achieved if you can assist your client by implementing a reasonable set of policies and procedures, and leading the way to a right-sized planning system.

A while back, I happened on an acquaintance at the grocery store one Sunday afternoon. I know Greg is a bachelor so I was surprised to see him wheeling 2 full grocery carts down the aisle. After exchanging pleasantries, I asked Greg what he planned to do with two carts full of groceries. Blushing slightly, he explained that, despite the urging of relatives and friends, he never got into menu planning. “So, I just come here every Sunday and buy everything in the store’s sale flier,” explained Greg. “Since starting this, I’ve never run out of groceries during the week.” After exchanging more pleasantries, we went our respective ways.

On the way home that day, I was struck with the realization that many of the manufacturers I’d met over the years do exactly the same as my friend Greg. Absent an effective means for planning, they respond by purchasing a load of inventory – just in case they need it.

No one could argue that just a little planning wouldn't significantly reduce the inventory either Greg or any manufacturing company chose to carry.

For Greg, running out of strawberry jam probably wouldn't disrupt his meal production for the week. He'd probably just swap in grape jelly and enjoy his BP&J sandwich just as much. If you are a manufacturer, the cost of poor planning can be extreme. Running out of model 57T34 roller bearings could bring an entire production line to a standstill. Effective planning of production and planning activities becomes imperative.

Production Planning

For most manufacturing companies, the Production Department creates the demand that drives most manufacturing activities. Production demand may originate with customers who lodge sales orders, but this demand is first observed in Production.

Production planning begins with an accurate understanding of the time required to build the product, starting from the lowest level subassemblies all the way up to the finished good. The bill of materials section of any manufacturing software you purchase should allow you to clearly document production lead times, that is, the time (in hours or days) required to complete any particular assembly.

Most manufacturing software includes a Master Production Scheduling (MPS) module. This module computes start and completion dates, beginning from the expected customer ship date of the finished good, and working back, assembly level by assembly level, to determine when production should begin. For companies where production is driven from a forecast rather than firm sales orders, the MPS module can usually accept a list of items and completion dates. Some more sophisticated software can examine historical sales activity and produce a forecast for the future.

The job of the MPS module is to analyze the inventory of the finished good, matched up with the demand created by sales orders and/or a sales forecast, and predict the shortage of subassemblies over any range of time. Basically, it answers the question "If you want to ship this on such and such a date, when do you have to start building it?"

Purchasing Planning

Unless you are carrying way too much inventory, the MPS module of a computerized manufacturing system will identify shortages for all the raw materials and purchased parts required to complete the assembly of finished goods and subassemblies. Since the MPS starts with the ship/completion date of the finished good and walks back through lower and lower levels of subassembly, the MPS module will also be able to determine when any raw material is required for a particular production step.

The purchasing module of a manufacturing system will know who the suppliers are for each raw material item, and the estimated order lead time for each item. So, as the MPS module is walking its way down through a bill of materials structure, it can be examining the available inventory of any of the raw materials it encounters. From there, the software will be able to predict exactly when each item should be ordered so that it becomes available just in time to be used in the assembly process.

The notion that not all the required material is needed on Day One of the production process is the key to effective purchasing planning. By purchasing only the required amount of material, and never purchasing it before it is actually needed (or, sadly, after it is needed) inventory holding costs can be dramatically reduced and missed ship dates virtually eliminated.

You may set your sights on a manufacturing management system that helps you maintain an inventory. Far more valuable is a manufacturing management system that helps you maintain NO inventory.

Running a manufacturing plant on no inventory may be an unachievable goal. Nevertheless, any effort you make in that direction will pay off handsomely.

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Chapter 7 - The Value of Avoiding Mistakes

Engage any manufacturing manager, any purchasing agent, or any production worker in conversation about how well their plant is functioning and the discussion will soon turn to some disastrous mistake that caused them to repurchase some material, rebuild some assembly, or miss some critical customer ship date.

Unfortunately, the benefit of avoiding these mistakes is almost always missing from my discussions with the management of the company about the cost of manufacturing software. As you address the idea of acquiring a new manufacturing management system, cost will inevitably come up as an issue. In your exploration of possible solutions, be sure to consider the value of avoiding mistakes.

Inventory control mistakes

As we've discussed in a previous chapter, maintain an inventory is a knee-jerk reaction to the lack of adequate control. Without sufficient ability predict the demand for raw materials, a manufacturer is inclined to load up on inventory – just in case it is needed. What a mistake!

In my experience, a manufacturer with \$1 million worth of raw materials can usually trim 25% off their inventory holding cost, freeing up \$250,000 to invest in manufacturing software and other tools. If the inventory is financed at conventional rates, cash savings of over \$12,000 per year can be realized. Assuming the software will last 5 years, you can afford any manufacturing system costing less than \$62,000.

The system you eventually select should have specific functionality designed to help you reduce your inventory, not maintain it. Only then can you enjoy a positive ROI from your manufacturing software.

Purchasing mistakes

The value of avoiding purchasing mistakes is perhaps most obvious of all. No one wants to purchase the wrong item – or the right item at the wrong time. Most inventory control systems are able to create a list of items that are running short. Some even give you the ability to respond by creating corresponding purchase orders. But, in the world of purchasing it's all about timing.

Purchasing material too late seriously endangers your ability to deliver your finished product to your customers on time. You may have spent months building the world's fastest racing car, but you can't deliver it to the customer if the tires aren't due to be received until next month.

Purchasing too early will shift the burden to your company's finances. Material you acquired right away in order to avoid late customer delivery needs to be paid for much sooner, tying up financial resources needed elsewhere.

In order to avoid serious purchasing mistakes, make sure the system you select knows about multiple suppliers, item lead times by supplier and, most importantly is able to predict the optimum order date for any material you will need to complete future production.

Production mistakes

Generally, production mistakes occur in two areas:

- Failure to predict/control desired completion dates
- Failure to predict/account for actual production costs

A missed delivery date can be extremely expensive in terms of customer retention and corporate reputation. No one would argue that meeting customer ship dates is important, but few have policies and procedures in place to guard against such mistakes.

The manufacturing system you acquire should have the ability to create a manufacturing work order that corresponds to the customer sales order. Furthermore, the system should allow you

to log work against the order so that progress (or more importantly, lack of progress) is obvious to management.

The system should also allow you to post any "extras" (extra material, labor, or overhead) incurred in the production process. That way, when the work is complete, an accurate analysis of the actual production cost can be delivered to management.

Summary

While these mistakes can never be totally eliminated, they can be dramatically reduced when sufficient controls on inventory, purchasing, and production are in place.

Few people can put a price on the damage incurred by missing a ship date and angering an important customer. But manufacturing companies without sufficient systems in place to avoid the most common purchasing and production mistakes pay the price over and over.

You will hear it from one; you will hear it from many: "If we only had a system that could help us avoid making these mistakes." The good news is that such systems are available, they cost far less than the mistakes they will help you avoid, and most of them work very well.

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Chapter 8 - Web Searches

When it comes to finding the best manufacturing software ever developed, I suggest you stay at home, go back to the computer, and use the greatest marketing tool ever developed: the Internet search engine. Whatever search engine you prefer, the key to success is not producing the largest selection of manufacturing systems. Instead, I recommend that you focus on manufacturing systems that are designed to work with your existing accounting system.

Unless you are planning to ditch the accounting system as part of the acquisition of a new manufacturing system, this will allow you to focus on products that fairly match your existing accounting system in size, complexity, and price. (If you are planning to implement a new accounting system, stop reading this now and don't come back until you have arrived at your short list of accounting systems.)

Instead of searching for "manufacturing software" which will yield over 17 million results in Google, try something like "manufacturing software for sage 50" or "manufacturing software for quickbooks" which will narrow the search to a mere 75,000. This is still far too many, but the



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good news is that the most relevant hits (the ones at the top) point to products that are likely to work with your existing accounting system.

Your short list of likely manufacturing systems should consist of products that offer "seamless" integration with your accounting system. That is, your manufacturing system should have the ability to read and write data directly into your accounting system. Ultimately, the more your manufacturing and accounting systems function as one, the happier you and your staff will be.



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