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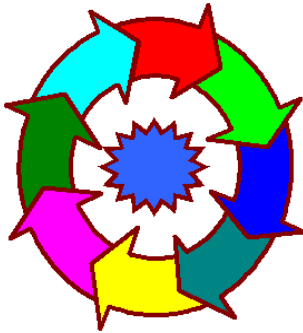
A Newsletter for
Job Shops–Niche Manufacturers–Focused Distribution Systems

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Variations on a Job Shop Theme



We first started to understand differences between job shops and mass production manufacturing almost 20 years ago when we solved a long-standing problem for Hyde Tools. The solution required separating their mass production business from their make to order business, both of which were muddled together in the same organization. The make-to-order business we carved out continues to operate to this day as [Hyde Industrial Blade Solutions](#). (You can read the [Case Study](#) here.)

Background: There was absolutely nothing in the literature we could find at that time that dealt with job shop management *per se*. Virtually everything was based on the dominant paradigm of mass production; job shops were unrecognized and unappreciated. Lately, a number of academics and consultants have taken up the cause of job shops, but they typically show a lack of understanding of the dynamic complexity inherent in managing these types of businesses. It seems they continually want to force tools and techniques from the Toyota Production System into areas where they don't fit, don't work, and can cause more harm than good.

We've done our best to attack the proliferation of this type of misinformation, but it is more widespread than we have the resources to combat. The best we can do is to educate and inoculate *Speed to Market* readers so you don't wander down unproductive paths. (See [Confusing Job Shops with Mass Production](#) in the May 2007 issue of the *Speed to Market* Newsletter, and [Toyota Is Not Lean](#) in the September 2007 issue.)

As we continued to build a body of job shop management knowledge, it made sense to use "job shop" as an umbrella term for businesses that exhibited the following common characteristics:

- Produce on an order-by-order basis to meet customers' specifications.
- Secure work through a bidding process, and thus tend to be highly competitive.
- Typically serve other companies and/or distributors vs. consumers or end users.
- Are highly specialized—product differentiation is generally limited to variations within a basic product category as opposed to product variety.
- Are extremely diverse in terms of output, technology, operations, and size—output can range all the way from single parts to complex sub-assemblies. Materials can include metals, plastics, paper, rubber, cloth, and ceramics... virtually any material with commercial applications. Production technologies are equally diverse.

- Are not all manufacturers—printing, engineering services, architectural design, advertising agencies, construction companies and others, all operate on a similar order-driven business model.
- Are service businesses (See [Job Shops are Service Businesses](#) in the January 2007 Edition of the Speed to Market Newsletter).

Building a Body of Knowledge: Since the Hyde experience, we have continued to work in, study, and write about job shops, with a focus on the difficulties inherent in managing them. *Speed to Market* readers are likely familiar with the books, *Speed to Market: How to Cut Lead Time and Increase Profits in Job Shops and Order Driven Businesses*, and [Speed to Market: Lean Manufacturing for Job Shops](#), as well as [A Primer of Job Shop Scheduling](#). We have written and published some 50 articles in 33 Speed to Market Newsletters dating back to November 2002, over a dozen magazine articles, a Speed to Market CD training program, and countless seminars and after-dinner talks. This body of knowledge has also come from working with some 50 job shop clients to help them improve performance and profitability, to become more competitive, and in some cases, to survive. Countless conversations and communications with *Speed to Market* readers have added depth and new insights to the mix.

Now that we have a better understanding of these types of businesses, it seems appropriate to start to discuss variations on a theme. We have defined what job shops have in common; now we can begin to explore some differences among them, and the implications for management.

Work-in-Process Time: A major difference among job shops is how long it takes to convert an order from a quote to cash. Typically, a machine shop may have a two to three week lead time with the ability to process emergency orders in a day or two. Tool shops, on the other hand, may require two to four months to design and build a die or mold. This difference has implications for how the organization is structured and staffed, as well as the design of the management system.

For example, because work is in and out relatively quickly, machine shops do not require the project management infrastructure which is necessary in a tool shop. Work in process can be tracked and managed with an integrated capacity planning, scheduling, and shop floor control system. We have designed and installed systems of this type that can handle 40-50 orders shipped per week with a minimum of administrative time. (See [Schmald Tool & Die Continues to Improve](#) in the August 2007 *Speed to Market Newsletter* for an example.)

Tool shops, on the other hand, require a great deal of coordination among individuals and departments within the organization as well as with customers. (This need is heightened as tool shops convert from a craft shop to a process model.) Without an adequate project management system and well-trained project managers, it's too easy for things to fall through the cracks, for delays to add up, and for mistakes to be made. All of this jeopardizes what should be the guiding principle in these types of businesses...*to deliver on time and on budget*. (See [On time and On Budget: The Bottom Line for Job Shops](#) in the November 2006 *Speed to Market Newsletter*.)

Size of the Work: Another significant factor among job shops is the physical size of the work itself. In some shops, you can carry a day's production around in a bucket; in others, a single order may weigh several tons. This, of course, has implications for equipment and infrastructure (cranes, load-bearing beams). It also has implications for scrap and rework. It's one thing to scrap a small item, and another to scrap a casting that may cost several thousand dollars, and have a six-week lead time. This is not to say that care is not exercised in the production of small parts which often require tight tolerances and high precision; it's just that the stakes are so

much higher when it comes to mistakes with larger items. This can require a great deal of checking and double checking (longer set-up times) to minimize catastrophic errors.

Engineered and Prototype Products: A typical problem in businesses that require extensive engineering as part of the product development process (engineer to order) is the lack of control over the time required for engineering. When engineering time is not estimated or contained within a timeframe, production time is consumed (the ship date does not change). This can result in chaos on the floor as production tries to make up for lost time, and increases the probability that ship dates will be missed. This, in turn, has a damaging effect on the company itself as customers perceive it to be unreliable, and may choose to place their work with competitors in the future.

There seem to be at least two factors at work here. One is that engineering work, especially when it comes to prototypes and new products, is not routine and so time is difficult to estimate. There is a fair amount of trial and error as designs that would appear to work in theory may not work in practice...hence the term, "back to the drawing board."

However, another factor might best be described as attitudinal. Many engineers get caught up in their roles as professionals and believe their time is not subject to the same rules as other workers. As professionals, they believe their work cannot...and should not...be subject to estimation, measurement, and managerial control. Imagine the chaos if surgeons took this approach when it came to scheduling operating rooms.

If you have this problem in your organization and it is having an adverse impact on your ability to deliver when promised, you have to address the underlying attitude, as well as the need to develop an appropriate control system that will enable you to manage this portion of the process with greater precision.

Contract Manufacturing: Another variation on the job shop theme is contract manufacturing. In a contract manufacturing relationship, a shop is generally awarded a blanket order for some number of items to be produced and delivered over a defined period. For example, a customer may issue a purchase order to buy 2000 items over 2 years, but the timing and quantities released are not specified or necessarily predictable. The shop invoices the customer for the quantity released when it is shipped.

The fact that releases against the order are most often erratic in terms of timing and quantities, and the customer wants virtually immediate delivery, forces the job shop into operating a build-to-inventory (mass production) manufacturing model (often in addition to the job shop model which coexists at the same time). This means the shop has to anticipate or forecast demand and build ahead to some finished goods inventory position. In effect, the only thing that separates contract manufacturing from a mass market, build-to-stock business is that sales are guaranteed by a purchase order, so the shop is not subject to the vagaries of the market, which can leave units unsold and obsolete inventory.

Shops that are not familiar with, or have no expertise in build-to-inventory production, will likely find themselves confused and unprofitable. The solution is to learn how to manage two radically different production systems at the same time. (See [Contract Manufacturing: A Variation on a Job Shop](#) Theme in the November 2004 *Speed to Market Newsletter*.)

Multiple Trades: Some shops, especially those that make specialized machinery, may require multiple trades. For example, electricians, hydraulic technicians, welders, machinists, sheet metal workers, refrigeration mechanics, and others may all be required at specific steps in the production process. This results in a more complex organization which is more difficult to manage as sequencing is important and production planning more critical. Some are union

environments, and conflicting jurisdictional claims may arise that can delay production as they are being worked out. Some work may be outsourced which adds even more complexity. Again, a solid project management system and team is essential.

Batch Processing: Yet another variation on the job shop theme is batch processing. In this case, a batch of raw materials is compounded according to a recipe in sufficient quantity to produce one or a number of products. For example, airplane fuel tanks are compounded from a rubber mixture and made to a specific size and shape to fit a specific airplane. Batch processing is also used for in the food processing, pharmaceuticals, and other industries.

Problems in these environments may involve estimating the amount of compound required...too much and there is waste; too little leads to rework or lost sales. Process control is another critical factor. In some cases, the right amount of ingredients must be added at the right time with the proper temperature ramp up to achieve the desired compound specifications and characteristics. Failure to control the process can lead to quality problems and waste.

High Volume Production: Contrary to a popular image, some job shops produce orders in the thousands of pieces. These types of businesses require extensive in-process quality control because when something goes amiss, scrap is created at an alarming rate. Operators are trained to monitor tolerances and other critical specifications; quality assurance technicians supplement operators' efforts on the floor. The quality control system itself is designed to incorporate the proper statistical sampling parameters.

Summary: We have used "job shop" as an umbrella term when referring to order driven businesses, and have tended to focus on their similarities rather than their differences. However, with increasing knowledge, it's appropriate to differentiate among types of job shops and begin to discuss these differences and their implications for management.

We have identified seven variations on a job shop theme in this article, and briefly touched on some of their characteristics and management challenges. (We could probably write a book, or at least a monograph, on each.) Without understanding the underlying architectures and requirements of different business systems, your attempts to bring about performance improvement by applying canned remedies are most likely to be ineffective at best, and destructive at worst. Each type of shop and organizational architecture must be approached individually, hence Delta Dynamics' guiding principle...*client driven solutions*. Beware of those who are selling cure-alls, and use your own business knowledge and understanding to determine what makes sense for your company.

Note: You can use this article, along with those referenced, as a refresher course on managing job shop dynamics. Print them out, package them up, and distribute to your key people. Then, convene the group, discuss what they learned, and how it can be applied to your company to improve performance and profitability.

The Effective Manager

The Effective Manager does lots of things, but there are at least three things he or she must do:

- Think about the purposes of the organization and the direction in which it must be led;
- Foster and manage change; and
- Conduct operations so that the organization and its people can function effectively and efficiently. *Thinking About Management*, Theodore Levitt, The Free Press, 1991