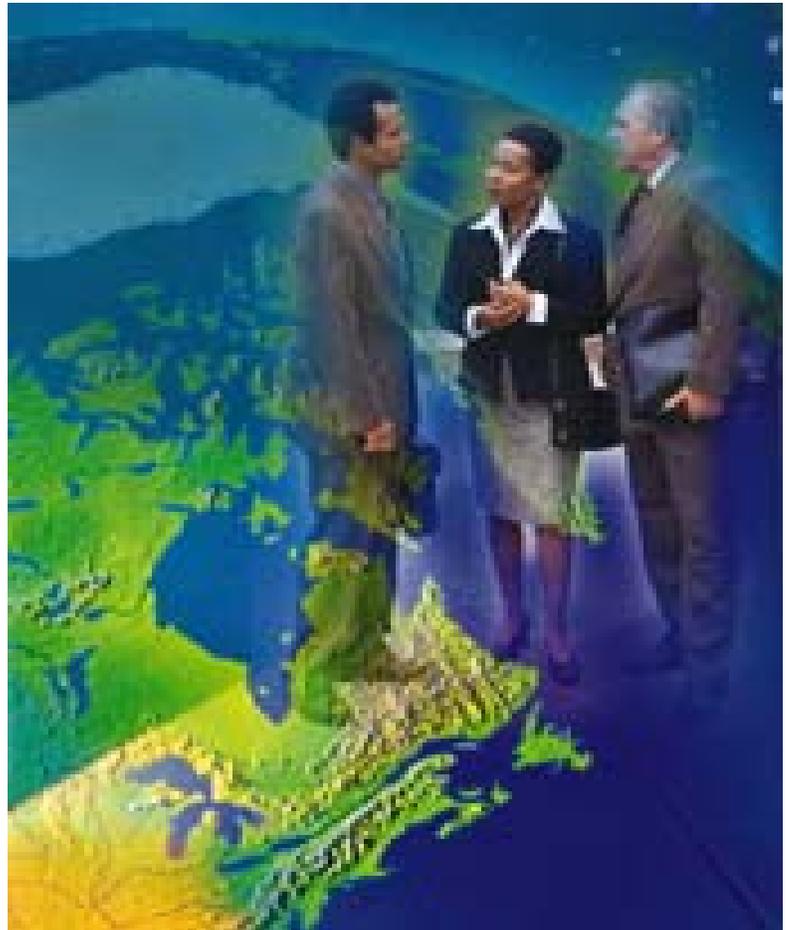


REENGINEERING SEMI-CUSTOM MANUFACTURING PROCESSES



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The Nature of Semi-Custom Design

Many companies are engaged in semi-custom manufacturing. These companies have core types of product offerings. They build variations of these core types rather than build entirely new products.

Historical Evolution of Design Practices

The cycle starts with a salesperson discussing their core product offerings. The salesperson writes up the order as a set of requirements.

Next, a designer reviews the requirements and selects a similar old order that can be used as a starting point. To select a similar old order they first rely on their memory, which is mostly of just of the ones that they designed. They ask other designers for suggestions only if they want more choices. However, usually they are the only designer involved. Then they make a copy of the old order's documentation and modify the copy to fit the new order.

The designs experience a natural evolution. A design tree begins to sprout. If we name each machine after the person who ordered it the tree begins to look like this:

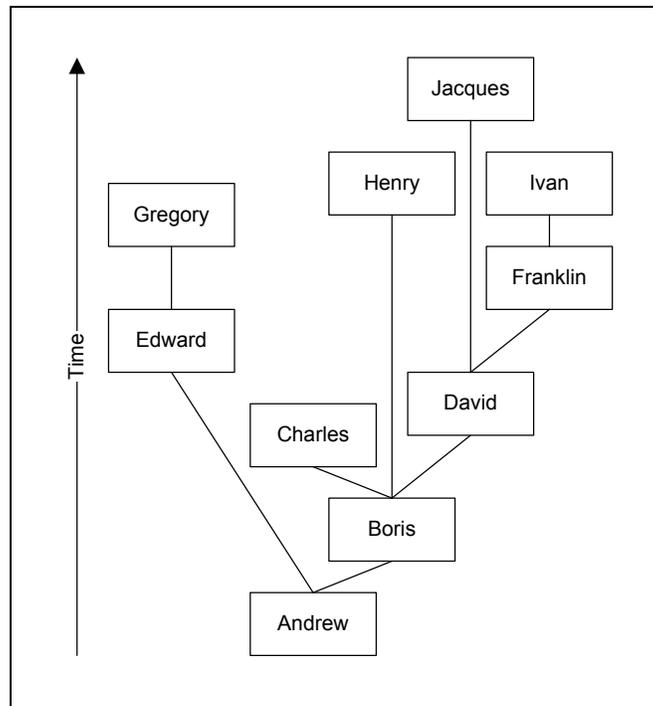


Figure 1: Evolution of Designs

The new design is often based on a design that is several years old, and the designer then tries to remember the multitude of improvements that have been incorporated into designs since then. Invariably some improvements are overlooked. This practice has led to companies not taking full advantage of best practices, to a propagation and explosion of ordered parts, and to a multitude of other problems.

Root Cause of These Problems

Let's look at the root cause of these problems.

The root cause is poor design control.

One type of poor design control is a process that lets designers introduce needless variations in designs. This occurs because too many design decisions are left up to individual designers without adequate checks and balances. This is very common in companies where most design tasks can be performed by several designers. Obviously, having several employees skilled in each task has some great benefits. One great

benefit is that isolated absences don't bring production to a halt. Companies then make the mistake of letting their designers introduce needless variations in the designs. For instance, these companies allow different designers to produce parts lists that are needlessly different.

Another type of poor design control is a process that permits gradual deterioration of design integrity. This often occurs when the designs from old orders are changed for new orders. After several generations mistakes accumulate.

Design Control Methodology

What these companies should do is make their processes conform to best practices. The best practices approach allows any designer to suggest improvements. These suggestions would be formally discussed among the designers and other interested parties. Some suggestions would be prototyped. Surviving suggestions would be documented into the company's best practices and incorporated in future machine designs.

By following these steps, semi-custom manufacturing companies can systematically capture best practices and ensure they will be incorporated into each custom order going forward. The result is a convergence of best practices instead of a hapless divergence of practices. By converging best practices there will be fewer surprises and better results.

Sources for Best Practices

Best practices can come from your company, your industry, and other industries. They can come from domestic and foreign companies. Spectrum studies these practices and tailors a blend of the best practices suited to your specific mix of culture, resources, and customer needs and expectations.

A Long-Term Mentality Is Needed

It is within the reach of most companies to reengineer their processes to take advantage of these efficiencies. Unfortunately, most companies either

- do not have the willpower,
- only think about the current and next quarter or current fiscal year, or
- don't have a structured approach.

Spectrum provides a structured approach, one that can increase your willpower to make additional improvements. Spectrum's approach to process reengineering involves careful thought and insight. Often, the best approach is to reengineer processes incrementally and to start out by reengineering just a few at a time. The first increment of reengineering will probably be the largest and most important one for that process. This increment is usually followed by further continuous improvements to the process over time. The ideal candidates for Spectrum to start with are processes that are core to the business, are highly visible, and that can be reengineered in 2-4 months. By reengineering a few processes at a time, this small series of successes builds momentum and a spirit of teamwork. Employees see that their input is valued and they also take pride in their visible accomplishments.

Obtain Worker Support

Business process reengineering needs the support of the workforce because their input into the process is essential. When undertaking a business process reengineering effort, it is critical that employees' jobs are not threatened by the outcome. Otherwise you can expect the quality of their input to be non-existent. Wait to begin until you know that **you will not reduce your workforce**. You might focus on the fact that streamlining processes makes it easier to grow your business. In that case let them know that you want to fix processes before growing your business. Assure everyone that they will keep their jobs, then extol the many benefits that you feel your company will derive from the effort. These benefits might include:

- Providing salesmen with a quicker turn-around on quotes
- Providing salesmen with standard but customizable products to sell
- Shifting work from peak workload periods to relatively idle periods
- Reducing order turn-around time
- Capturing best practices
- Reducing needless variety in designs

- Reducing the number of parts used
- Reducing inventory
- Reducing the number of suppliers you deal with
- Reducing the load on purchasing
- Taking advantage of volume purchase agreements with suppliers
- Letting suppliers see how their products are used
- Building problem-solving partnerships with suppliers and customers
- Establishing more accurate prices for options by having more accurate actual costs
- ...

Practice Friendly Management Support

It is very important that management makes the process and product reengineering effort a priority. If management does not appear to support it, most people won't offer much support either. The company will only have small islands of reengineering, if any at all. Many of these islands will disappear if there is turnover in their key positions. The company culture needs to encourage and support process reengineering. As W. Edwards Deming stresses, the workers want to do a good job, but either management repercussions or worker fears often restrict them. Most people in most companies take pride in doing good work, and want to do even better work. Spectrum's approach has made it easier for processes to yield better results and simultaneously smoothed out the workload so that production was more scaleable.

Another aspect of management support is to realize that people will make mistakes. When they do, top management needs to make sure they are not punished. When a mistake is made for the first time, it is often a good experience for the company, because the employee has learned. Of course, if the employee makes the mistake repeatedly, that is a different situation. But most mistakes are part of the learning process.

Iterative Improvements

Especially in the beginning, process redesign often undergoes continual improvement with trips back to the drawing board for a few adjustments. Do not expect to reengineer a process on paper and have it work perfectly when implemented. Do expect the reengineered process to become stable and noticeably improved after a few orders have passed through it.

Spectrum's Time Metrics for Reengineering

It takes time to reengineer a process. As a rule of thumb when Spectrum reengineers a design process, it takes 2 to 3 times as long to reengineer it as it does to execute the existing process, so reengineering is best done during relatively non-busy periods. For instance, if it takes 3 weeks to design a machine, expect Spectrum to spend 6 to 9 weeks redesigning the process. Spectrum has several designs go through the process so that some variances in requirements can be captured.

The rewards quickly become evident during busy periods. A well-designed process can take half as long to execute as the process it replaced. The accuracy and consistency gained improves the quality of the final product too.