Creating a Furniture Factory for The Future

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Back in August 1999 I spoke to the Manufacturing Division meeting of the old American Furniture Manufacturing Association on the subject of the furniture factory of the future. My presentation included many suggestions on how a more customer-responsive, more profitable furniture factory must be organized.

I closed by saying that without substantial change in our operating logic most domestic furniture plants would soon look like the photo of the White Furniture Company factory shown on the next page. Since that time, our industry has experienced the closure of over 300 furniture plants in the US and Canada. Hundreds of companies in our value chain from lumber and veneer mills to machinery builders and carton plants have been shuttered. Thousands of jobs have been lost. Since then the U.S. has become somewhat like a third world country – shipping logs and lumber overseas and importing value-added wood products in return.

Management guru Peter Drucker said, “Business has two and only two functions: marketing and innovation. Marketing and innovation produce results; all the rest are costs.” Given our industry’s track record over the last two decades, it’s easy to say that we put the NO in the word INNOVATION especially in the case goods sector.

But that’s water over the dam. In many ways the closure of these plants was a blessing. The domestic furniture industry that was built and operated from 1960 through the mid 1990s could never compete with the Chinese in making the products we were asked to manufacture.
Looking Back

Fate of the old industry model...

300+ plant closures, thousands of lost jobs...
Due to the bursting of our housing bubble and the related crash of our financial world, the ensuing tidal wave of imports from around the world has somewhat subsided. We've experienced a one-two punch. First we were hit by the structural shift to lower cost, offshore suppliers. Now we are in the midst of the most severe downturn in the business cycle most of us have ever experienced. At the moment we have tons of under-utilized capacity around the world, a hollowed-out domestic case goods sector, and a financially vulnerable retail network. Our industry has morphed into being a NO-PROFIT ZONE.

Rapid change is upon us. As a result, some now ask if the tectonic plates underlying the world economy have shifted sufficiently to enable a rebirth of U.S. manufacturing. Could a so-called ‘furniture factory of the future’ make a go of it in the U.S.? This afternoon you will hear my opinions in response to that question.

But first let’s begin with a brief description of how to build a furniture factory for the future.

Where do you begin? There’s only one place to start – with a solid marketing plan. That document must precede any work on plant design and define your target customers, target products and volumes, and value proposition.
Critical design parameters are found in your company’s Marketing Plan...

- Who Are Your Customers?
- What Is Your Offering?
- What Is Your Value Proposition?
From that basic strategic information the factory owner must define the factory’s manufacturing task ie, what the factory must do well to support the company’s plan. As important, the manufacturing task must state what the plant will not do. It’s OK to say NO. In fact, in my opinion, it’s mandatory to do so.

Next the manufacturing task must be screened against four basic principles:

• **Value Chain Efficiency** – The factory is a small part of the value chain. Achieving efficiency is not only the responsibility of the plant manager but also the job of the entire company from the corner office down through marketing, sales, finance, and human resources as well as every link in the value chain from raw material suppliers to logistics providers and finally to the resellers. A factory, no matter how efficient, cannot make up for friction and bad decisions through the rest of the value chain.

• **Focus** – The factory must be focused. A factory can only achieve a limited number of objectives. You cannot simultaneously optimize all of the usual performance metrics applied to manufacturing operations. Thus in a factory of the future, the product line and volumes to be built, the technologies employed, and the markets served must be narrowly defined and continuously managed.
Your Manufacturing Task

From your Plan’s information you can define...

➢ What must the factory do well?
➢ What will the factory NOT do?
Manufacturing Philosophy

Four key principles must be considered...

- Value Chain Efficiency
- Focus
- Production Alternatives
- Simplicity
• **Production Alternatives** – Many operational alternatives exist. Planners must open their minds to all of the possibilities of factory scale, scope, location, and organizational structure. There are lots of niches, combinations of products and markets, that can be served and lots of ways to serve them. The factory can be large and fully integrated, small and dependent on its supply chain, or any combination in between.

• **Simplicity** – Its processes must be simple. *Focus* provides *simplicity*, simplicity enables *repetition*, and repetition breeds *competency*. A well-designed process must remove the difficulty of getting things done. That means eliminating waste. Using lean manufacturing philosophies to drive out waste is a critical part of the design of any factory for the future.

In order to compete successfully you must deliver the right product at the right price to the right place in the right time. That sentence broadly defines the challenge that faces every manufacturer. For each target customer segment there exists a specific combination of those components:

• **The right product** (its design, quality, construction, materials, level of customization) – The factory of the future builds a short, controlled product line designed on a well-conceived platform that defines the design limitations, the materials, the type of construction, and the scope of customization. Pareto’s 80/20 rule is used to manage its product line.
Ultimate Objective

Success depends on delivering...

- The Right Product
- For the Right Price
- To the Right Place
- At the Right Time
• **The right price** (the production cost, materials/labor/overhead, volume, inbound transport costs) – The factory of the future sets a price then works continually to take out non value-adding materials and processes. The objective of its product engineering is to identify what a cost could be rather than just to calculate what a cost is.

• **The right place** (the production locations), point-of-sale locations, outbound transport costs) – The factory of the future is located where it can readily access raw materials, components, and supplies as well as service its targeted customer base.

• **The right time** (the required production speed, transport speed, availability to satisfy the consumer) – The factory of the future manufactures its products within a well-defined schedule in order to ensure the target delivery requirements. This attribute requires strict control of its supply chain, its internal production cycle, and its downstream logistics.
The process I’ve briefly described calls for a real planning effort. We’re not talking about spending 30 minutes a month on this task. We’re talking about convening your best and brightest minds, closing the door, and thinking creatively until you have a strategy for your company and a manufacturing task for the proposed factory. This is the hard part. It takes an open mind, some knowledge of strategies from other industries, and a willingness to check your experience at the front door. Experience is only valuable if you believe tomorrow will be like yesterday, that tomorrow’s customer demands will remain like yesterday’s, and the concept of selling furniture has stopped evolving. Without solid, open-minded planning you should not attempt to build a factory of the future. Save your money, your sweat, and your tears.

Once the manufacturing task is set, the next step is to assemble the key components into a conceptual factory design. These components are:

**Technology**

No shortage of great furniture manufacturing technology exists for any combination of price, volume, customization you envision in your manufacturing task. The truth is technology is being introduced faster than users can install it.
Key Factory Components

Success depends on combining the optimal process components...

- Technology
- Suppliers
- Space
- People
Great technologies cover the waterfront of needs required to build a factory for the future:

- **Materials** – Examples are lightweight panels with honeycomb cores that minimize material content and save transport cost. High tech waterborne coatings are available to eliminate harmful pollutants,

- **Process Machinery** – You have a vast choice of machinery depending on your manufacturing task. Some plants need highly flexible Part Machining Centers like those shown on page 15. These machines can efficiently produce one discrete part then automatically change over for another part configuration in seconds. Alternatively if your manufacturing task calls for high production, you can select High Speed Integrated Lines like those shown on page -- that can produce 30 identical parts per minute.

- **Material Handling Equipment** – A key part of any factory for the future is effective material handling like fork lifts that handle long loads in narrow aisles and robots that feed machines.
New Materials

Lightweight Panels
Process Machinery

Five-Axis Machining

CNC-Controlled Drilling
Handling Equipment

Narrow Aisle Fork Lift

Robot Feeder
• **Information Systems** – Computerized tools that allow you to manage the production hardware include:

A **purchasing system** that ensures the right amount of the right materials is available when needed,

An **execution system** that schedules operations in the correct sequence and timing for on-time completion – Nothing concentrates a plant’s attention on completing its work efficiently more than trying to stay on schedule, and nothing improves capacity utilization more than maximizing throughput of the plant’s bottleneck,

A **product system** that enables efficient product engineering plus provides critical specifications and instructions to front line workers via the execution system and to suppliers via the purchasing system,

A **measurement system** providing both managers and front line workers with critical metrics that show how the plant and its individual elements are performing vs. the targets. Such a system is commonly referred to as a balanced scorecard or dashboard. Information systems are important.
Information Systems

Four critical systems for a winning factory...

1. Purchasing System for material procurement and inventory control
2. Execution System for controlling production
3. Product System to engineer/specify products
4. Measurement System to publicize performance
Based on my experience, I would prefer to compete with a plant that has great systems and mediocre equipment than vice versa.

**Suppliers**
A key decision in designing a factory for the future is selecting what materials and components you will make internally or buy from specialty suppliers. The factory of the future will always choose to do what it can do well and buy the rest. Often that choice depends heavily on the availability of capital and talent. Most companies do not have an infinite equipment budget nor do they have the range of skills to manage and execute every necessary process. Why not let specialty suppliers make the capital investments and hire the skilled front line workers and experienced managers necessary to fabricate certain components?

**Space**
A true factory of the future will have its processes located on a purpose-built site and housed in a purpose-built structure. Only by physically organizing the required processes in the optimal configuration can a factory’s performance also be optimized. By doing so, the access points, doors, walls, columns, ceiling heights, utility entrances, safety requirements, and other features can be located so as not to compromise operating efficiency. While a new factory may not be attempting to be the low cost producer in its market niche, it doesn’t want to be the high cost producer either.
People
The success of any factory depends primarily on the quality of its work force. I would prefer to have mediocre plant and equipment operated by a world class team than vice versa. A factory of the future must be staffed with people:

• Who care if you succeed
• Know how to help you succeed
• Have reasons to learn new skills

To generate those qualities, factory of the future management must:

• **Conduct formal employee education programs** – World class plants invest 40 hours of formal training per year and pay their workers when in the classroom. The curriculum should include training in problem solving and exposure to the strategically critical pieces of your business. Often the most productive changes begin at the grassroots with passionate workers who have solid analytical skills and understand what really matters, what drives success.

• **Foster leadership skills** – Great companies have great leadership from the corner office down to the plant floor.
People

Building a world-class team requires...

- Conducting formal education programs
- Fostering leadership skills
- Empowering front line workers
- Publishing key performance metrics
- Paying for learning new skills
- Developing a bias for change + action
• **Empower the front line workers** – A well-led and trained work force can be empowered to manage their activities, assure quality, improve their process, maintain equipment, and train new team members. By taking on these activities the front line workers replace costly supervisory and support overhead.

• **Publish their key performance metrics** – All workers want to know how they are doing vs. your expectations.

• **Pay for new skills** – Doing so will motivate them to improve and provide sound back up for every job.

• **Develop a bias for change and action** – Probably the most important human element in a winning factory is a bias for change and action. The ability not to fear change and possible failure is key to keeping a factory on top of its game.

A factory for the future must have good engineers to drive continuous improvement in product and process. And they shouldn’t be the first people laid off when times get tough.

Given a choice, I would prefer to have a plant with mediocre equipment and a world class work force than vice versa.
As you can see, the *factory for the future* is the sum of lots of moving parts. It’s not a single template that can be applied to any and all situations. You can’t look up the factory design in the index of an industrial engineering textbook or a machinery manufacturer’s catalog and simply replicate it. Rather it’s the assemblage of all the elements needed to excel at those tasks that your company’s strategy calls for.

**Two Factory Models**

Looking across the vast spectrum of product/market combinations in the wood furniture industry, I believe there are two clear segments where a factory of the future can prosper in the U.S.:

**Factory of the Future No. 1**

The first is semi-custom, medium- upper medium-priced wood furniture that gives the consumer a wide selection of style, configuration, species, and finish. In this value chain the consumer has substantial input into the purchasing process and receives delivery in a matter of a few weeks. We eliminate the overbuilding, excessive inventories, and wasteful transport costs associated with the traditional furniture value chain.
Model No. 1

Semi-Custom/Medium Volume Factory...

➢ Stylish Products
➢ Lots of Choice
➢ High Quality
➢ Upper Medium Price
Process equipment is fully flexible to enable manufacture of lot sizes of one part and one product, one order at a time. This plant must be capable of one-off parts production and one-off unit assembly. Limited work is completed before a customer order is received. Specialty suppliers provide key components within a few days of order. Throughput time is measured in a few days, not weeks.

A key asset in such a plant is its information system. Order information must seamlessly flow through the product engineering system and via the execution system out to the front line work force. On page 27 you can see the terminal and the label printer at the Panel Saw. Labels are applied to each part as sawn.

These labels contain bar-coded information that directs the set-up of subsequent machines. On page 28 the bar code selects the proper edge banding material and instructs the operator how many sides to process. Notice too the return conveyor that enables one-man operation.
Semi-Custom Model

One-Off Parts Production

One-Off Unit Assembly
Semi-Custom Model

Information Interface
Semi-Custom Model

Processing Information

One-Man Operation
I call this model the **cabinet plant on steroids**. Cabinetmakers have operated this model for years and successfully defended their turf from lower-cost imports.

There’s no reason a basic semi-custom cabinet plant cannot be beefed up to build residential solid wood and veneered furniture. In fact, it’s already happening.

The photos on page 30 show youth bedroom, home office, entertainment, and dining room furniture made by semi-custom kitchen cabinet makers.

Page 31 shows two pages from the catalog of a semi-custom wood furniture maker.
Cabinet Plant on Steroids

Youth Bedroom

Home Office
Cabinet Plant on Steroids

Home Entertainment

Dining Room
Cabinet Plant on Steroids

- Choice of 6 buffet feet
- Choice of 3600 color combinations
- Choice of 18 table legs
- Choice of 12 chair legs
- 18 choices of decorative hardware
- Choice of over 70 fabrics and leathers

A. G. RAYMOND & COMPANY
Factory for the Future No. 2
The second factory for the future is a high production plant 180° removed from the semi-custom scenario. This model gives the consumer great functionality, less choice, decent quality, in exchange for a very low price. Such a plant produces a narrow product range designed around a base material/construction platform and fabricated on highly focused technology.

The plant’s culture concentrates on relentless cost cutting and attention to performance. Product engineering continues well beyond a new item’s introduction. The goal is to lower costs across the line by two to three percentage points each year. That’s accomplished by applying new machining technology and minimizing material content.

This plant does not look anything like a conventional furniture factory of the 1990s. It employs lightweight panels as its material platform, foiling and finishing lines for applying UV-cured waterborne coatings for surface decoration, and ships everything flat packed.

It operates three shifts and pushes out huge volumes through machine and finishing lines. Material handling is highly mechanized. You should never forget that nothing trumps high speed, high volume production for lowering unit labor cost.
Model No. 2

High Production Factory...

- Functional Products
- Less Choice
- Consistent Quality
- Low Price
High Production Model

Lightweight Panel Making

Foiling Line
High Production Model

- UV Finishing Line
- Flat Packing Line
I call this vision the **IKEA model** named, of course, after the über brand of the home furnishings industry. IKEA strictly abides by its product strategy as defined by a matrix with three price points and four styles for each item. A new stock keeping unit is added only if one of the existing twelve is deleted. Its plants are concentrated on a limited product range to minimize set-up changes, flatten the learning curve, and hence increase efficiency. Their Danville, VA, plant produces only 26 basic items in various colors for a total of 96 finished SKUs. Note too that IKEA is not afraid to tear out a relatively new machine line and replace it with the latest technology to cut cost. They also maintain the highest standards for safety and environmental friendliness.

I believe these two versions of the furniture factory for the future can prosper in the US. Most believe that case goods manufacturing in the U.S. is uneconomical and impractical due to regulatory issues such as air permitting. But few, if any, in our industry have completed a comprehensive make vs. buy analysis comparing a foreign supplier to a state-of-the-industry factory like I’ve described. I am certain of one fact – IKEA knows more about the cost of producing furniture than anyone in the universe. And that company put a huge investment in manufacturing on the line here in the U.S.
The IKEA Model

IKEA 2009

Home is the most important place in the world.

Our biggest idea is the smallest price

$69.99

LACK TV bench. Oak veneer. Printed and embossed LACK. Wear-resistant MDF. Made in China. 156 x 74 x 42 cm. Excl. shelf: 822.95. excl. TV. 201.83. (1) 193.22.

Design and Quality IKEA of Sweden
Potential Roadblock

Business in America

Its next problem: Big Government

PLUS A 14-PAGE SPECIAL REPORT
Conclusion

While I am optimistic about domestic furniture manufacturing, I do have some concerns that are beyond the realm of manufacturing technology. The editors of *The Economist* magazine highlighted these concerns in the May 30, 2009 issue.

My first concern is the prospect of higher environmental barriers. Permitting a new factory in the US is not currently that onerous. However the EPA’s recent decision to regulate CO2 as a greenhouse gas under the Clean Air Act could mean new regulations. And who in this room can define the impact of the various carbon cap-and-trade proposals now milling around in Washington?

Other worrisome developments have appeared on the political radarscope: The Employee Freedom of Choice Act – better known as the card check law – and the recent proposals for the Chrysler and GM bankruptcies could change years of legal precedents.

*We should never forget that capital, talent, and ideas go where they are well treated.* If investors foresee their money being ill-treated, financing innovation in our country could be stymied.
Thoughts To Consider

> You don’t have to be everything to everybody

> It’s impossible to achieve revolutionary performance without reinventing what you do and how you do it

> Manufacturing is a critical part of your strategy even if you aren’t a producer
A wise Greek man named Pericles about 1600 years ago said, “Just because you don’t take an interest in politics doesn’t mean politics won’t take an interest in you.” We, as individuals and as an industry, simply must be at the table when decisions are made that affect domestic manufacturing.

I leave you with three important thoughts that will hopefully guide your thinking on the furniture factory of the future:

• **You don’t have to be everything to everybody** – Hard working Americans, no matter how well equipped, cannot excel at everything. But it’s a large market with many product and market combinations. You can build a nice business and compete effectively by taking advantage of a single narrow niche.

• **It’s impossible to achieve revolutionary performance without reinventing what you do and how you do it** – Needless to say, if our industry is to produce here in the U.S. again, we must employ the manufacturing principles and concepts discussed earlier. The old models no longer apply. We can’t do it in a 1970 vintage plant.
• **Manufacturing is a critical part of your strategy even if you aren’t a producer** – If you rely totally on suppliers for your production, their plants must be aligned with your manufacturing task. Their owners and managers must understand what they must do well to support your company. That task goes well beyond just making product for the lowest price.

To sustain our long-term well-being, the U.S. must understand the importance of manufacturing to our economic health. I believe that a sound manufacturing base must be restored. No one has proven that you can support a growing standard through financial engineering and flipping hamburgers. In fact, the past eighteen months have proven the opposite to be true.

North America has abundant timber resources, tons of available technology, and a strong entrepreneurial spirit. Manufacturing can regain its rightful place in the U.S. if it uses capital and labor productively. Doing so is up to people who do their homework, take risks, and develop breakthrough ways of doing business. I hope someone in this room is up to that task.

- Art Raymond