

How To Manufacture For Profit

By: Jonathan B. Adams P.E. MBA

Contents

By: Jonathan B. Adams P.E. MBA.....	1
Preface.....	3
Chapter 1 – Financial Statements	5
Chapter 2 – General Hiring.....	39
Chapter 3 - Hiring Operations People.....	66
Chapter 4 - Hiring Technical People	76
Chapter 5 – Free “HR” and the Rest Will Follow	86
Chapter 6 – Technology.....	116
Chapter 7 – Inventories	122
Chapter 8 – Industrial Engineering Section.....	151
Chapter 9 – Quality	180
Chapter 10 – Purchase Orders & Contracts	187
Chapter 11 – Key Performance Indicators.....	197
Chapter 12 – Meetings, ESH, and Other Thoughts	200
Chapter 13 – Distribution, Sales, and Marketing.....	208
Chapter 14 - Conclusion and Closing Thoughts	218

2024 Copyright – Jonathan Adams

Preface

Being an engineer, I find myself indebted to a 17th- century philosopher and mathematician named Blaise Pascal. Much of what I know regarding mathematical equations and how they model the world is a direct result of discoveries made by him. I recently came across one of his thoughts recorded in his famous work *Pensées*. “*The last thing one settles in writing a book is what one should put in first.*” How fitting to include that here.

My career as an engineer over the past two decades has occurred almost exclusively within the industrial environment. Throughout my professional experience, I have had the pleasure to witness various calibers of operational aptitude. Upon reflection of all that I have observed thus far, it has become apparent to me that there are two extremes which exist in the world of manufacturing.

It has been my good fortune to have worked with organizations which operated very streamlined and profitable businesses. Some of these manufactures would inspire awe and wonder among their observers with their calm and carefully planned approach. To study such operations in action is reminiscent of gazing at a multi-jeweled Swiss watch which is expertly crafted. Sadly, these types of businesses are rare.

On the other tail of the distribution, I have also bore witness to organizations which have gripped their dying businesses so tightly that the executives hastened their ships voyage to destruction rather than correcting course to better seas. These contrasting entities were rarely a consequence of fate or poor timing. Rather, the stark differences were usually a result of who was leading the companies.

Operating a successful business is easy as selling your product for more than it cost to create and market it. Any business owner or manager who starts to ignore such realities will find themselves without a business very quickly. There seems to be a myriad of competing priorities for the attention of the business owner in the modern industrial world. Consider the mountains of regulation, social media advertisement, political turmoil, societal and cultural shifts, inflation, poor labor markets, etc. It truly is no mystery as to why it is becoming increasingly difficult for owners to keep their eyes upon the goal.

This work was created in hopes that it would aid the manufacturing business leader with recognizing two truths. The first truth being that profitable enterprise must unapologetically remain the major objective. If profitability ever fails to be the priority, none of the other goals which are to be accomplished via operating such a business will ever be realized. The second truth is that unconventional thinking is usually the key to success. A business leader should never stop questioning their operation and should cultivate curiosity.

The target audience for this work is the small to medium sized manufacture; however, I am confident that it can aid other business models as well. I trust that no matter who you are, there is value to be found among this work's pages. You may wish to consider this book as a consultant, coming along side and asking you all the important questions that you have not thought of, or that you have been deliberately hiding from. (You already know if that is you, and you need to remedy that now!) I hope this book serves you well.

Chapter 1 – Financial Statements

It is no secret that many entrepreneurs are rarely accused of being spreadsheet enthusiasts. Many experts are convinced that the creative process, coupled with a comfort toward risk, precludes most entrepreneurs from becoming masters of the analytic side of business operations. While it is best to position individuals toward those tasks that most capitalize upon their inclinations and strengths, the business leader does not often possess the luxury of remaining ignorant of quantitative matters. He cannot exclaim that he is not suited to understanding operational and financial data. Such declarations are often just excuses. Many owners or managers will use excuses to absolve themselves from taking those actions that they know are necessary but make them feel uncomfortable.

I am human and am no exception to this rule. For a long time, I used to make excuses concerning my being a “poor salesman” or “not naturally gifted in conversing with strangers.” Those were excuses and nothing more. The reality was that sales made me uncomfortable due to my lack of familiarity with conducting sales activities. I was afraid of proving myself to be below average in the area of sales. By holding on to those excuses, I was able to justify my not attempting to master sales, and subsequently my poor performance regarding revenue generation. “It is not really my fault!” A common internal refrain that few wish to admit too.

The business world, especially manufacturing, is difficult. There is no quarter given to those who wish to embrace excuses. The only correct course for the owner or manager to take is to admit their fault, shoulder the true responsibility which they have, and to overcome their weakness. If there are others who depend upon you, whether that be family or employees, you

do not have the luxury to hid behind excesses. Why should others suffer so that you can remain comfortable. Business leaders which act in such ways are selfish. Selfishness is everywhere.

It is imperative that you as the business owner or manager does not hold on to excuses when it comes to understanding the quantitative measures of your business, chiefly financial measures. The importance of mastering financial statements cannot be overstated.

During the Civil War, there was a young man who had recently graduated an accounting program at around the age of 16. This young man lived in Northern Ohio and worked for a firm that traded commodities. Often, he would scrutinize every delivery ticket and invoice that appeared on the firm's receiving dock. This young man would not suffer a single cent to be unaccounted for in the ledgers he kept for his employer. Later in life, the young lad became one the of the richest men in recent history and his name was John D. Rockefeller.

The story was often told that Rockefeller would take a perspective business owner who's business he wished to acquire on a little field trip. Mr. Rockefeller would bring that man to the headquarters of Standard Oil. John would then proceed to open his ledgers and show how inexpensive it was for him to produce his refined oil product...a cost so low that it was made evidently clear to the perspective business owner there were only two choices, join Standard Oil, or wait to be put out of business. Those early years where Rockefeller learned to master the financial ledgers played a big part in his ability to amass his business empire.

The utility of financial statements has not changed since the time of Rockefeller. You have only to look at the movement of equities upon quarterly earnings releases to understand that these statements make a difference. This is not due to some mysterious group think phenomena.

The reason that so many institutions pay attention to the financial statements of companies is because they truly are a good measure of business performance.

There are a few reasons for this ignoring. A lack of familiarity, ignorance regarding the amount information that can be obtained, a fear of failure to comprehend. There is also the fact that most people can find looking over financial statements to be somewhat dry and boring. It is often ironic how those same people never have a problem looking at their bank statement or collecting statements of collateral to obtain another loan.

Financial statements are a lot like bank statements. They show any observer “where the money is going” and under the careful study of a trained eye, financial statements show much more. The goal of this chapter is to teach the business owner or manager where to look and what to pay attention too on the financial statements of any company, especially their own.

If your business has yet to obtain an industry standard accounting software, this is something you should remedy immediately. The accounting software that exists today is affordable, powerful, and excellent. Spreadsheets cannot compete with a good accounting software program. There are even some satisfactory free software options available for businesses. If you are unwilling to manage the accounting software yourself, part time bookkeepers are also readily available. Such a contractor or employee is always a worthwhile investment, and it is an investment that you should make when the time is right.

Income Statement

The remainder of this Chapter is going to refer to a figure illustrating a sample Income Statement. Such statements may also be referred to as Profit and Loss statements. Your income statement may look slightly different depending upon the nature of your business but most

income statements will follow the same type of format. It should be noted that the following pages will not be a comprehensive course in finance, but it will help shed light upon what ideas and thoughts should be cultivated when evaluating financial statements.

Every line on the income statement has a story to tell. Every line should prompt you to ask questions and drive you to seek more answers.

Sample Income Statement	
Revenue	\$ 50,000,000.00
Cost of Goods Sold	\$ 20,000,000.00
Gross Profit	\$ 30,000,000.00
Expenses	
Marketing	\$ 4,000,000.00
Wages	\$ 5,000,000.00
Rent	\$ 50,000.00
Interest	\$ 40,000.00
Depreciation	\$ 80,000.00
Supplies	\$ 100,000.00
Total Expenses	\$ 9,270,000.00
Taxes	\$ 4,146,000.00
Net Earnings	\$ 16,584,000.00

Figure 1-1. A sample annual income statement.

The first line on any income statement is the revenue line. You may have heard of such terms as “top line revenue” or “top line sales.” This line can also be displayed as “Sales” in some instances. The amount of money displayed here represents the total amount of money taken in from clients and customers. If you have experienced the pleasure of watching social media videos, then you will undoubtedly have noticed that when most individuals describe their business as a “Multi-Million” dollar business, they are often referring to their revenue amount and not their profitability. This can be extremely misleading due to the fact net profit can be negative

despite revenue numbers being in the millions. These self-proclaimed descriptions offered by the social media savvy regarding the worth of their businesses are usually fictitious. As you can see from the example in Figure 1-1, \$50 Million dollars is much different than \$16.5 Million, despite the great margins presented.

The COGS line is usually displayed after the revenue line. This is often more commonly referred to as the Cost of Goods Sold. The COGS figure represents the amount spent on purchasing material for the product. “How much did the carpenter spend on lumber and nails while he was constructing the deck?”

These two figures are utilized to calculate what is known as Gross Profit. The gross profit calculation is made simply by subtracting the amount of COGS from the top line revenue. Gross profit usually does not receive a great deal of attention in the financial world, but it should not be ignored. If two businesses that sell similar products or services have vast differences in their respective gross profit margins, then questions should arise.

All other expenses that a business incurs usually fall below the gross profit presentation. These expenses include any amount of money spent (excluding COGS) that are required to conduct business and maintain operations. That means if mop water is purchased for the floor, it is accounted for in this area. If there is rent on the building, it is also accounted for here. Some of the expenses may be unique, but for the most part, they will be common bills incurred on a monthly, quarterly, or annual basis. If you have ever wondered why there is so much emphasis placed upon expense tracking, your answer is the income statement. Being able to reduce the Net income via recording every expense and available depreciation is critical in reducing the tax burden of a business. The total expense line is simply a subtotal of all the expenses (except for the COGS.) It makes the math easier as you go down the statement.

At this point in the income statement, all of the necessary components are in place to calculate the tax burden on the business. (Note, this is usually a little more complicated than presented here due to different depreciation rates and tax credits, but for this illustration, assumptions of simplicity will be made.) The IRS considers the taxable income of a business to be the revenue minus the COGS and all required expenses to operate the business. Since taxes must be paid for out of the business accounts (this is assuming no pass-through entity structures) the tax burden will also be accounted for on the income statement. This allows anyone who examines the income statement to calculate the effective tax rate, and the final net earnings for the business. In the example presented in Figure 1-1, taxes were calculated on \$30,000,000 - \$9,270,000 = \$20,730,000. As you may notice, since the effective tax bill for this company was \$4,146,000, the effective tax rate was 20%.

Net earnings are usually presented at the bottom of the income statement, and this is the figure that most people are interested in. Should they be? One dirty little secret of the financial world is that there may be motives to present this number higher or lower, which in turn affects a company's financial decisions. Bare in mind how net earnings is calculated. With the income statement, a business is able to write off taxes, expenses, and the cost of goods sold. However, the business bank account still must pay for all of these items. It is very common for a business to have positive net earnings, yet still require a credit line to get through the year because there is no money in the bank account. Now contrast that reality with the fact that it is also possible for a business to have a negative net earnings, and still be flush with cash.

Once one is equipped to understand how Income Statements are created and presented, questions can start to be asked. It is common for multiple years of statements are available when evaluating financial statements. This allows you the opportunity to make some important

discovers and ask prudent questions. For example, upon seeing an income statement such as the one presented in Figure 1-1, you might inquire about a few issues. The following questions are ideas that should leap “from the page” when you are evaluating an income statement.

“How does this year’s revenue compare with prior years?”

“How many sources of revenue exist currently?”

“Is this business depending on just a handful of customers?”

“Has everything been done to reduce the Cost of Goods Sold?”

“Has the company looked into hedging?”

“Is the Tax status on material purchases being accounted for correctly?”

“Are their discounts being utilized?”

“Would making purchases on cash back credit cards be more beneficial than Purchase Order Numbers?”

“How many product lines does the company have?”

“Are the gross profit margins significantly different to similar businesses?”

“How is the market for the highest margin product, is their room for expansion?”

“Is there a low revenue/low profit margin product offering that should be considered for deletion?”

“Is there room to boast sales?”

Many common issues that business face can be best examined via peering into the income statement.

Revenue

Revenue is King. There is no business without revenue. A company whose revenue is not growing is a clear indication of a company which is in decline. Revenue is the source of cash which is used for asset purchases and debt payments. Revenue is where everything begins...and in many cases...ends. How often are you paying attention to your Revenue? This is an important question. Many businesses who refuse to address this question don't stay in business for very long. Since revenue is so vital to the health of a business, what are some ways that the business owner can go about boosting revenue?

One of the greatest tools available to the business owner and managers is price discovery. The term price discovery is usually reserved for those who discuss bid and ask spreads in the equity markets, but it can also be thought of in another way.

For example, let's say that Bob owned a store on Main Street in his hometown. Bob's store specialized in selling cookware. Now in Bob's store, there was a certain skillet that brought in a nice profit margin of 40%. How did Bob decide on that amount of profit margin? Why did Bob select that price for the skillet? Most likely Bob picked the price based upon what he thought the market could bare without having any data to back up his decision. Another common pricing technique that folks like Bob use is to simply calculate what profit is needed on that skillet and simply add that to the cost of the skillet.

How strange. The price point of a product or service can have tremendous impact on the amount of revenue brought into a business. Yet prices are often just assigned based upon

convenience of calculations or sometimes guesses, rather than data. What if Bob acted differently toward his store than the average business owner? What if Bob actually placed some data and math behind his pricing decisions. Perhaps for two months he raised the profit margin to 45% on his bestselling skillet, then to 50% during the two months following his last price increase. The next step for Bob would be to start stepping back his price each month for the final three months of his experiment. Assuming that Bob has great records and data, he could now start to look at his sales as a function of his price, and evaluate the best price point for optimal revenue generation.

Obviously, he would wish to filter out holidays, special town events on Main Street, etc. but there would be some data to look at. Could it be that Bob makes more money when his skillets are priced at a 45% margin? Perhaps the increase in price had no bearing on the number of units he sold. Bob may have been underpricing his skillets for years.

Conducting pricing experiments like the one in the above example can easily bump revenues by a few percentage points if conducted correctly. Remember this, 2% over ten years starts to add up. This is an easy tool that everyone who sells products or services can take advantage of. Price is often more elastic than business leaders realize. This is especially true if the product is marketed and positioned correctly.

One of the cornerstones of conducting price discovery experiments is to keep detailed and accurate records. Using poor data or failing to capture possible contributing variables will lead to erroneous conclusions. If an owner was attempting to conduct such price discovery experiments in the middle of a new marketing campaign, then the experiment needs to account for that variable. Obtaining statistically significant data and being able to understand that data is critical to developing actionable insight. Decision predicated upon poor data, or improper

understanding of the recorded results, can lead to losses rather than gains in revenue. If you as a business leader decided to conduct such an experiment, it is important for you to take your time in planning it. Think through the experiment carefully and consider all of the variables that you are going to need to record. How you will go about accomplishing the task. No pricing experiment will be perfect, and any leader who wishes to engage in this practice will have to use some judgement on how to conduct the exercise. Nevertheless, the results will offer any business powerful insights into how owners and managers might optimize revenue generation.

The proceeding example of Bob and his store on Main Street was rather simplistic. Many manufactures do not enjoy direct to retail customer transactions. Given the fact that most manufactures sell to wholesalers and distributors through bulk orders, acquiring enough sales transactions to conduct a statistically significant price discovery experiment may prove difficult. That does not offer such a manufacture an excuse to not try, it just means that such an owner or manager may have to get more creative in the way they consider and test price discovery.

Product Mix

Product mix is a great way for businesses involved in manufacturing to boost revenues. Most manufacturing businesses are created to produce a limited number of product variations while others find themselves naturally expanding their product offerings due to customer demand. No matter what category that your business falls into, there is always opportunity to increase revenues by altering product mix.

This point is best presented with an example. Imagine a company that only produces one item, with two different options for their customer. The margins on this product are the same for either variation that is selected by their customer (for the sake of this example, the margin will be

50%.) Now consider this same company deciding to sell a companion item. Imagine a knife manufacture starting to sell sheaths. Perhaps this company would not possess the expertise to manufacture the companion product, so they would have to contract that manufacturing process to some other business. Even so, if the company under examination here could still exact a 10% margin on this companion product, wouldn't that be worth it? If a company has already acquired a customer, shouldn't they take advantage of that effort and capitalize upon it by selling the customer more product?

This concept is the entire premise behind upselling in the retail and commercial space. It is rare that industrial companies and manufactures considering utilizing those same types of sales practices. That is truly a shame because the logic supporting the success of upselling is quite sound. Have you ever taken time to consider all of steps that a customer must go through in order to initiate and conduct a purchase transaction? The customer first must acknowledge that they have a need or a want that should be met via conducting a purchasing transaction. The customer then must research your product, and your company to determine two facts. Does the product or service meet the customer's needs/wants and is your company trustworthy and reputable. Once this is decided upon, only then will the customer purchase. *The customer has decided in their own mind that your product has more value than the cash that they are willing to give you in exchange for the product.* This type of transaction builds goodwill toward your business in the customer's mind. In addition, the customer is already in an emotional state of releasing funds-so why not capitalize on emotional state and assist them. If you truly cared for your customer, you would make sure they have everything they might need to be successful.

Product mix can also be augmented by simply producing another product. the prospect of developing and producing another product can seem daunting for many manufacturing

leaders. The best way around such obstacles is for business leaders to be creative in their considerations of new possible products. Perhaps you could make a list of easy to manufacture products that can utilize some of your existing equipment? Does your manufacturing equipment set idle on nights? Is there a product that could be easily produced on the idle equipment that has a ready market? Once you allow yourself the chance to explore these missed opportunities, you may be surprised how much potential truly exists in your current manufacturing facility.

Non-Tangibles

There are many other revenue boasting activities that the manufacturing company can get involved in beyond price discovery and product mix. Most of these activities center around the idea of selling non-tangibles. Unfortunately, the connotation of selling non-tangibles does not necessarily infer the idea of “non-cost” in regard to the product or service creation. Nevertheless, there are usually a few opportunities that exist in every manufacturing environment. Below is a short list of non-tangibles that might be considered:

Extended product warranties

Custom shop orders

Product repair services

Owner’s clubs

Subscription models

No matter what form a non-tangible may take, all of them will incur some sort of overhead and administrative cost to implement. This trend of selling non-tangible products and

services is very in-vogue. There may be opportunities for the savvy manufacture to subcontract out some or perhaps all the administration.

Extended Warranties

Many large manufactures offer extended warranties to their customers. A large majority of these extended warranties are sold and administered by insurance companies who specialize in offering extended product warranties for client manufactures. Consider the following instance. Your loved one goes to purchase an extended warranty on a new smartphone, it is not the manufacture that is standing behind that warranty, but rather an insurance company. In fact, some of the larger insurance companies have entire smartphone divisions set up to take in warranty return phones and resell them on the market as refurbished. Such administrative services are not limited to just cell phones.

While there might not be a willing insurance company or financial institution to partner with for every manufactured product, that certainly does not imply that a manufacture should fail to investigate the prospect! If circumstances prove there do be no company that provides warranty services for your type of product, there may still be a chance to create a warranty program that will be of financial gain to your company.

As alluded to previously, creating a warranty program will incur some initial setup and administration cost. This cost usually proves to be a wise investment with an attractive ROI if the program is created correctly. Most often, a program such as this will require some assistance from an actuary and an IT professional, along with a small group of employees to oversee long term administration. Once a warranty program is in place, many manufactures find themselves

enjoying consistent and predictable warranty sales. A great concept that you should truly consider if you wish to increase your company's revenues.

Custom Shop Orders

Another topic that has been included in the previous list of non-tangibles is the idea of custom shop orders. Despite the fact that the custom shop order concept requires the production of a physical product, the concept and the marketing of the custom shop model is certainly a non-tangible idea.

The key to any profitable custom shop venture is to limit the choices that can be selected when ordering the product. That sounds as though it is a complete contradiction, but it isn't. Consider the fact that auto manufactures, gun manufactures, and knife manufactures have conducted such practices for decades. All of these businesses have offered "Custom Shop" orders with only limited selections available to the customer. This practice actually becomes more of a marketing technique that just so happens to correspond with revenue generation.

One of the main reasons that so many different industries have used the "custom shop" model is because it has proven itself to be an excellent way to boost revenues. Consider a customer who is considering purchasing a product as offered. With the custom shop idea, this same customer may conclude that if allowed to create a custom shop order with the upgraded selections they desire, then the product becomes more attractive. So attractive that it initiates a purchasing decision.

This custom shop concept provides even more advantages. By creating and operating a custom shop ordering platform, any manufacture will be able to gain insights into their customer's taste. The data collected from the custom shop ordering process will prove to be

beneficial by providing insights into the ordering preferences of a manufacture's customer base. This data, if properly analyzed can prove to be a form of market research.

For all its advantages, tacking on a custom shop order to any manufacturing operation is not a complete panacea. There are important steps regarding implementation that should be adhered to. One of the major considerations is the choices that are offered to the custom shop customer and how those choices are integrated into a manufactures existing production line sequence. This is best illustrated with an example.

Dave has been operating his pocketknife business for the past 25 years. For the past 7 years, Dave has been promoting his business on various social media channels, and these efforts are beginning to pay off. His following across all these platforms is substantial for a such business. Dave has continued to develop and expand his product offerings over the years. His business is now selling 14 different models directly to the customer via internet. Each knife model offered by Dave's business is available in three different handle color options, and two different blade steels. Dave's business is very impressive considering the size of his operation and manufacturing facility.

Most manufactures who sell via the internet have an ordering page on their website. Dave is no exception. Dave's web designer created the ordering page in such a manner that customers can select which options they want their knife to have based upon the knife design/model that they select. Thus, before a customer submits their payment information, the customer gets to select their handle color and blade steel. This type of online shopping cart is common throughout online commerce.

While analyzing his sales data one day, Dave noticed something very interesting. Two of his most popular models, the “Wolf” and the “Sheep foot” knives were getting unusually large sales and great positive feedback. This realization sparked some creativity. Immediately Dave got to work laying out the plans for his own custom shop.

After some careful consideration, Dave decided that he would allow custom shop orders on only two knife models that accounted for the highest number of sales. Dave’s manufacturing process was already streamlined. Currently, he purchased his stainless-steel blades and his carbon steel blade blanks from the same vendor, and it turned out that Dave’s vendor offered other steels as well. Dave knew that he could offer two other blade steel compositions very easily. Dave analyzed his manufacturing process and decided that the additional blade steels on these two models would not really slow down his manufacturing process, and he had a workstation that was perfect for introduction of the additional blade blanks. Thus, for his custom shop orders, Dave would offer four blade options instead of just two.

Dave also was considering adding more options for handle material. When he streamlined his manufacturing process years ago, Dave designed his production line to be light in component manufacturing and heavy in parts assembly. Even so, Dave still made the handles in house. His assistant had recently come across a source of antler and walnut that they had been considering using for some time, and this project seemed especially perfect for utilizing the new material source. Since the handles were still manufactured at Dave’s facility, he was able to form the handles into smooth or rough feel. This offering was also considered to be an option for custom shop orders.

For a final touch, Dave considered purchasing an engraver for engraving initials in the bolsters. At this point, it really looked as though Dave had just added more options to his already

existing knife models. Technically that is true, but Dave decided to really sell the “custom shop” idea to see if he might be able realize more profit on these products.

One of the wonders of the custom shop strategy is the fact that it is half marketing and half production. After Dave had completely formulated his plan of what he was going to offer and how he would produce the orders, he then contacted his web designer. Dave requested that there be an extra page added to his website with its own special ordering system specific to the custom shop orders. This new custom shop webpage was to have its own shopping cart, page layout, and would contain marketing content touting the wonderful customization options. This new web page on Dave’s site would provide a more exclusive experience for the customer and would allow Dave to increase his prices for custom shop orders.

Dave enacted his plan. Of course, he experienced a few bumps and bruises along the way...but overall, it was a great success. Dave’s sales on his two most popular models were boosted by 13% and his margins on the custom shop orders were 12% more than regular priced models. Furthermore, it increased social media “chatter” about his products and offered him more video content for his marketing efforts. Great job Dave! By utilizing the existing manufacturing processes in place, along with a little creative marketing, the custom shop strategy can do wonders in boosting revenues for your company as well.

Product repair services is another “non-tangible” idea which some businesses may be able to utilize. Much like the custom shop concept, the product repair service offer is not completely without product handling.

Not all products lend themselves to repair services equally. Few consumers will ever bother with shipping a \$4 wooden spoon for repair. The feasibility of this strategy is price

dependent. Nevertheless, for those companies that produce items which sell for larger price points, repair profits can be lucrative.

There is a boot manufacture in the Pacific Northwest who utilizes this concept perfectly. They sell American made work boots priced higher than most other boots on the market. Rightly so given the quality of their product. A new pair of boots from this company is over \$400 in 2024. They decided to institute a rebuild program years ago. Customers get to keep their own boots, which they have worn in, but just need “cleaned up.” The repair services offerings include new bottom soles, hardware, repaired stitching, and new laces. The charge is significant, but so is the profit margin.

The customer must first complete an order for the service on the company website, and then ship the boots to Oregon. Typically, the customer pays for the shipping to their location only. By placing the return shipping cost burden onto the customer via pricing the return shipping into the repair fee, this boot company has reduced the complication of shipping issues and customer confusion as to who covers what cost. Such a service as this can be easily administrated by existing employees, produces large margins, and keeps customers brand loyal for years.

Owner Memberships

Owner memberships are another great non-tangible option to add to a manufacture’s offerings. This scheme can usually be accomplished with administrative work alone. Owner membership groups can prove to boost revenue and be a great marketing strategy. At first glance, it may appear as tough these type of arrangements are rare but you most likely have come in contact with one of these groups unawares.

Depending upon the business model, these groups can take different forms. Consider the grocery store chain Kroger. Anyone familiar with the company is aware of the Kroger Card. The benefits that Kroger receives from their customers utilizing the Kroger Card is multifaceted. Kroger ensures that anyone who shops at their stores can participate in the program by simply registering free of charge. Every time that a customer scans their Kroger Card along with the groceries that they purchase, the company is provided with vital marketing data concerning customer shopping habits. The amount of information that Kroger could potentially derive from this program is really astounding. Depending upon the amount and type of data that is recorded upon initial registration, the company is able to analyze demographic and geographic data about its customers. Armed with this information Kroger can easily derive even more information about its customers. If you were to give a data scientist an address, a name, and what credit card a person used (there is a demographic and an economic divide between customers who use Discover vs American Express) that data scientist could give a statistically significant band of probabilistic incomes for that individual. Consider that Kroger could also use their data to find out what items are purchased relative to their position in the store. For all category B size stores, Kroger may decide that they need to optimize their in-store merchandising to facilitate more sales after having analyzed the Kroger Card data. As you might imagine, the list of information that could be mined from the customer data collected is only limited by the imagination of the data scientist evaluating the program. A PhD in applied mathematics would have a field day with such a data set as what Kroger has in its possession. The benefits don't stop at large amounts of data regarding customer shopping habits. By incentivizing the customer with lower product pricing on certain items, and fuel points, Kroger creates shopping loyalty. As with any

membership or owners' group, there must be a carrot for the customer. It just so happens that Kroger was able to make the customer's carrot "nutritional" for Kroger.

Kroger receives marketing data and repeat customers in exchange for offering item discounts. That data allows Kroger to make decisions concerning how they sell their products while the repeat patronage fosters recurring revenue.

Any evaluation of owner's or membership groups would be incomplete without considering H.O.G. The full name being the Harley Owners Group. This a membership group consisting of Harley Davidson owners from around the world. The Harley Davidson Motor Company provides the administration and operational labor for maintaining the group and facilitating it at a corporate level. By having created local chapters that are part of each dealership, local administration and operational requirements are handled by existing dealership employees. Do not be mistaken, that was by deliberate design.

The major benefits that members of H.O.G receive come in the form of discounts. All of these discounts become available to members in exchange for an annual membership fee. Upon initial inspection it might appear that there is nothing but cost associated with maintaining the H.O.G.; however, that would be a rash conclusion. The annual membership fee exists for a reason- so the cost of administration can be offset. But the real beauty is in the events held by the local chapters at the dealerships. These events entice existing owners to purchase more products and accessories. Whereby boosting revenue for the dealers and the company. Imagine these members meeting at their local dealership and discussing their passion, all while being able to shop for the latest parts and accessories.

In 2022, Harley Davidson Motor Company's sales of parts/accessories and apparel constituted 15% and 5.5% of their overall revenue respectively. It is difficult to imagine these percentages being so high without the existence of the membership group. (Harley-Davidson, Inc. 2022 Annual Report (Form 10-K))

It is obvious that larger organizations can successfully utilize existing human capital to facilitate a membership group. The question then becomes how does the smaller company cash in on the action?

Instead of thinking of the membership administration as the selling of a product or a service, it may be more beneficial to think of the administration of these ownership groups as marketing activity. Just look at how they are constructed. Most membership organizations are created in such a way as to extract money from the customer to cover the overhead of operating the membership organization. The members of these membership organizations are then more heavily targeted with offers to purchase more product. Such membership groups also cultivate brand loyalty.

If a business is wanting to start their own owner or membership group, where should they begin? Presented below is just a small list of examples to consider.

Email list

Newsletter

Exclusive discounts (for your products and other businesses)

Exclusive videos

First to receive news about new products

Exclusive yearly meeting or event

Depending upon the business, some of the above-mentioned activities may prove slightly more difficult. The make-up of a manufacture's customer base may also have an influence on how a company approaches these activities. Creative may be required to adopt these ideas to a business, but the efforts will prove worth it. If you decide to try building a membership organization, think carefully about how you plan to handle the administration. Just remember, the number one rule in creating any type of a membership organization is to be sure to make it worth the customer's dollar, and worth your company's effort.

The subscription model is another non-tangible that needs to be considered, but carefully and with much caution. There have been many large corporations that have gravitated away from their own manufacturing divisions to chase after the subscription-based revenue model. The results of such actions have been disastrous in most cases.

This subscription model is the homecoming queen of the business world. Just count the number of subscriptions you are currently paying for. Due to the increasing technology that litters our lives, the number of invitations for people to participate as customers in such schemes seems to be growing. However, this idea has been around for a long time. Due to its popularity, it has captured the heart of many senior executives. Even executives of manufacturing facilities. The desire for this type of revenue to take root in the manufacturing CEOs heart is understandable. When this CEO looks around at his peers, he sees insurance companies (recurring revenue), technology services businesses (recurring revenue), and service organizations promoting new "maintenance plans" (recurring revenue).

“How is it that all these different business models can create recurring revenue streams?

Look at me! I am stuck with this old dinosaur that devours capital like a beast, is subject to business cycles, has a limited customer base, and is doomed with tight margins. It's not fair!”

Many senior leaders in today's manufacturing environment succumb to the above internal dialogue. Perhaps they should be reminded that it was manufacturing who “brought them to the dance.” Manufacturing is a challenging business, and it deserves the respect of all humanity who benefit from it. Manufacturing has always provided the products required for societies to exist. Since man first became aware of trade and expertise in craft, manufacturing has been present. Ponder this truth, commuting to work in your car is possible without your subscription-based music streaming service, but trying to drive your car to work without tires! There will always be a need for real tangible products that improve the lives of people.

Due to the difficult nature of the manufacturing business, barrier to entry is high. Senior executives and owners should take some solace in the fact that “no one else is coming.” Competition will always remain limited. If you carefully ponder the current business environment, entrepreneurs are rarely considering manufacturing. It is much easier for an ambitious young fellow to go start up a new Fintech phone app (because that is what society really needs right now! Another phone app.) All he must do is hire some developers and marketers who can all work remotely. Contrast this with this same entrepreneur's brother who has decided to build a factory that produces metal filing cabinets...and whoa! Which dream is more difficult to achieve? Whose problems would you want to trade for your own? I would choose to trade problems with Fintech man.

As attractive as the subscription-based model is, for most manufactures, pivoting to such a revenue model is usually not feasible. That does not mean that a company dedicated to

manufacturing should not augment their offerings with subscription-based products or services. The manufacture of countertop coffee makers will never be able to sell their product based upon a subscription-based revenue model. Such an idea would be silly. Yet, that same manufacture might be able to sell “the best coffee filters” on a subscription-based model. There is still room for recurring revenue in the manufacturing environment, but it must be presented strategically and solve an existing problem. Otherwise, such efforts usually fail.

If any manufacturing business desires to partake in a recurring revenue stream, there are wise ways to approach the venture. One of the primary steps that should be identifying any corresponding products or services which the manufactures customers want. Then the question simply becomes “Is there a way to sell these auxiliary products on a subscription basis?”

The next option is to sell a recurring service, but this is difficult for a manufacture to do and should be a last resort or avoided all together. If you feel as though you could make it work and have a good plan for doing so, then proceed, but otherwise “stick to the streams that you are used to.”

When evaluating new ways to acquire additional revenue, it is important for manufactures to focus on manufacturing as their primary business. The other actions and concepts mentioned above are to augment existing revenue, not replace it. There have been many owners and senior executives seduced by the promise of higher profit margins with less effort. That common mistake must be guarded against. Manufacturing should always be the main ship, sailing with the support vessels next to it. That is the only way for the entire fleet to arrive safely at its destination.

Expense Reduction

The inclination that most individuals experience upon being presented with an income statement is reduce expenses. The gravity of that idea is a direct result of that person having been exposed to a culture which promotes savings over additional revenue creation. Despite most Americans being saturated in commercialism, materialism, and an ever-present invitation to dive headfirst into debt, the voice of savings is still present in the thinking of the average citizen. “Be sure to save for retirement!” “Shop these discounts!” “This health insurance option provides a better drug plan!” “Buy bulk and save!” “You need an emergency fund!” Common refrains replayed more often than a bad pop song. The reason such ideas are so prevalent is because those actions are often easier than boosting income. Increasing income is a great deal harder than just cutting expenses.

There is an emotional component to cost cutting as well. Most people are taught thrift from an early age. Anyone who has ever spent time with a grandparent who lived through the Great Depression understands that an attitude of expense reduction is truly emotionally driven.

Most owners or executives will have a knee-jerk reaction toward cost cutting at the first waft of economic trouble. Having been steeped in such a culture, trimming expenses can often make an owner or manager feel like a hero, at least for a little while. It is often the case that when there are concerted efforts to “trim the fat,” important expenditures become reduced as well. This inevitably leads to unintended consequences. Approaches to expense reduction should be measured and precise. Below are two common stories that help illustrate that point.

Tonys Story

The first story was told to me by a gentleman that I worked with for a little while and requires some background information. This man had spent a significant amount of time as

maintenance manager and plant manager for a glass manufacture. The manufacturing of finished glass products is often a difficult and dirty process, frequently plagued with large capital and maintenance cost. Throughout the late 1990s and the early 2000s, there was a change in philosophy that affected most of the manufacturing corporations in America. These companies began to view their plant manager positions within their manufacturing facilities as “leadership development roles” instead of actual critical positions upon which the profitability of their entire corporation rest. The setting of this story occurs in one such corporations.

When the existing plant manager got promoted out of his position due to his great production record, a new plant manager was brought in to oversee the glass production facility. As is often told to the employees, this new plant manager was brought in to “continue and improve upon the success of his predecessor while finding new and strategic initiatives that will allow the facility to be better aligned with.....blah, blah, blah.” i.e. corporate speak ad infinitum.

The glass manufacturing facility that this new plant manager had inherited was an older facility; thus, large maintenance expenditures were common, and much capital investment was required to maintain operations. Despite that unfortune situation, the facility was profitable and producing well.

The new plant manager needed to change something so that he might have some positive influence that he could point too. There were also some new KPIs that were set for his tenure that related to cost. “I know what I can do!” exclaimed the new plant manager. “I can cut expenses!” That was usually the beginning of the cycle.

After the new plant manager had finished his cost cutting measures, he was able to present to the C-Suite a plant that was producing the same amount of finished product, but at a reduced cost, which clearly contributed to a higher profit margin! The new plant manager was a hero, and subsequently promoted out of the position, and replaced with plant manager 3.

Plant manager 3 arrived to facility to survey the condition of his new command. He found a manufacturing facility that was starving for maintenance activity. A plant that required heavy capital investment just to replace obsolete equipment. Furthermore, the results and consequences of his predecessor's expense reduction activities were becoming apparent. Production numbers were starting to suffer.

Plant Manager 3 spent his entire tenure requesting more funds. His request were not fully fulfilled and as a result, production metrics suffered. After careful deliberation, the senior executives decided upon the fact that it might be best to move Plant Manager 3 to another position where "his talents are better suited."

After this move, the company then ushered in Plant Manager 4 and charged him with bringing the facility back on track. The senior executives had concluded that the facility was going to require significant investment, and thus supported Plant Manager 4 with any expenditures that he required as long as the ROI proved reasonable.

Under Plant Manager 4's careful direction and the executives financial support, the facility was brought back to a state of production that it had not experienced since the first Plant Manager left. As a result, Plant Manager 4 had proven himself as a "turn around" expert and was promoted promptly to another position within the company. The wheel was preparing to make another revolution.

For anyone who has spent an extended amount of time in the manufacturing space, the proceeding story is not a shocking one. It is, at its core, a reflection of our human nature displayed in the selection and promotion of management. That same story can be retold at the departmental level, a facility level, or a corporate level. This common tale has been exhibited at every tier of the corporate hierarchy. The above illustration clearly demonstrates the careful consideration and investigation that must be conducted before expenses are reduced. If cost cutting measures are implemented rashly, unintended consequences will arise. These consequences echo far past the promotion of managers. Consider the glass company in the previous example. How are the company executives ever going to determine what the true cost is to keep their production facility operating at an acceptable level with the expenses changing so drastically? Another nugget of wisdom to extract from that story would be the nasty ramifications of placing short-term KPIs on managers, but that is for another section.

Anyone who was in a management role during the “Great Financial Crisis” of 2007-2010 (really the autumn of 2008) can recall how drastically organizations cut their expenses. The media made sure that the “Crisis” was ever present. Once the brokers in Manhattan saw people they knew lose their jobs and walk out of Lehman Brothers with banker boxes full of their possessions, sell orders flooded the markets. The economy looked as though it was about to end forever to most individuals. A state of emotional panic saturated every board room and C-suite in the world. Very few companies had an emergency plan in place for a “black swan” event. Most actions were driven by fear.

Companies drew down their lines of credit completely. *(This was the proper course of action. Any time there is a potential run on a bank, it is best that the funds be moved to the company’s account with interest payable to the lender. The alternative is to not draw down the*

credit line and need the funds latter, only to find the bank unable to extend the funds to the company.) After the credit line draw downs, organizations begin to cut expenses everywhere that they could. “No more color printing, only black and white!” Few organizations gave any consideration to the long-term implications of their cost cutting measures. This disproportionately affected manufactures and industry due to their heavy capital and maintenance cost requirements.

Expenses were cut from every department. Divisions were shutdown. Labor and management were laid off. The remaining employees were tasked to do more with less. Immediately after the “Crisis” had passed, and the bailouts “saved the economy,” senior executives started to notice something. Despite having their departments diminished, the work was still “getting done.” This was the beginning of woes. In capital light divisions such as finance, scheduling, and HR, the fact that employees could take on more responsibility and the financial statements appeared to be “okay” was a welcomed relief in the eyes of the C-suite executives. These financial statements failed to reflect the quality of the work in those areas, but the numbers looked acceptable.

Concerning manufacturing and heavy industrial businesses, the effects of reducing capital investment and maintenance activity was not realized immediately. The equipment seemed to be producing at the same rate, and that trend of continued performance despite a lack of capital and maintenance investment appeared as though it could be sustained forever. This was known to be a false reality by everyone who had spent time interacting with the production equipment at the facility level. But mid-level managers were in no position to exclaim that the savings could not be sustained.

For many owners and CEOs, the GFC felt like a heaven-sent miracle. This was the event that proved their suspicions were right! Their companies were “overstaffed and not optimizing their operation and maintenance budgets.” Many CEOs allowed the newly found operating paradigm to convince them of the fact that their organization had been operating based upon “legacy information from a less informed time.”

Ten years after the GFC event had started, the situation of those companies that were involved in the manufacturing and industrial space started to look much different. Those C-Suite executives that were there to usher their organizations through the 2007-2010 GFC left their positions to enjoy board seats at other companies and spend time learning how to retire. A new group of executives were now occupying those positions of leadership in the C-Suite, and they were starting to notice a few anomalies that they could not explain. Production metrics were starting to suffer. This was not just occurring at a few of their production facilities, but at all of them. From the perspective of the board room, all their manufacturing operations were becoming “money pits.” This was a long-term consequence of not having received the needed investment of funds and attention over the past decade, but this root cause remained hidden from senior leadership. They had eyes but could not see.

No matter how much capital and additional maintenance personal they throw at the aging facilities, there production metrics were not improving. For the production equipment, the remedy was being applied too late. Many of these executives started to rethink their career choices and begin to become envious of the non-manufacturing subscription-based business models that were flooding the market.

It was disappointing to see, but that was a common story in almost all manufacturing environments. Anyone that was at the manufacturing facility level during the past two decades

can attest to the previous anecdote. For many businesses, this issue is still not resolved. The same question of how to overcome the decade of diminished investment is still relevant for many management groups. Can you imagine a CEO or a CFO having to give a presentation at a stockholder meeting, or an investment conference and explain to the audience that the nice profit margins that their company had experienced over the past ten years cannot be sustained going forward. Furthermore, they were never sustainable, and as a result, over next seven years, all unincumbered cashflows are going to be directed into rebuilding the company's production facilities. Such a move by a CEO would be devastating to a company's stock price and possibly his career. Moreover, few CEOs would be able to successfully rebuild the company. Here's looking at you Intel!

Given the risk associated with hap-hazard expense reduction, perhaps there should be a process for ensuring correct methods are adhered too. This process should be the same for the small-town business owner and the Fortune 500 CEO. Before any cost cutting activities can begin, an executive must know their manufacturing process. That requires study and critical thinking. Those wishing to reduce expenses must be familiar with the amount of product their equipment and labor force is able to produce per unit of time. Obtaining a true baseline is essential for determining the amount of expenses that are truly required to maintain a certain level of production over a long-time horizon. Capital investments and maintenance costs must be evaluated with consideration given to the age of production equipment. Failure to acquire such an understanding of true manufacturing facility realities will always result in poor decisions.

Executives should reduce expenses in a surgical manner. It is best to think in terms of expense reduction instead of expense elimination. When expenses are reduced, it is usually

unwise to cut every expense down to the bone. The housewife needs some “room to breathe” in her grocery budget and so does the manufacturing facility.

Making smaller changes, then tracking the results is advisable. The most common mistakes perpetrated when expense reduction occurs is no one goes back to measure the positive or negative impacts of the reduction.

Before a manufacturing environment is evaluated for expense reduction activities, there are other areas that should be shored up first.

Perfect What You Have

This requires managers and executives to consider if there are areas in which operational efficiencies can be improved and production can be increased for little to no additional expense. Are the company’s assets already being maximized? How can more production be realized for the same amount of fixed overhead? Would it make sense to run a night shift? Can another product be produced where the only additional variable expense would incur COGS? Driving more revenues by asking these types of questions usually yields more net profit than expense reduction.

Pick Low Hanging Fruit

Most companies have low hanging fruit that they can pick but have simply been putting it off since the opportunity to do so will always be there. This is a mistake. Somewhere out there, the competition is picking their low hanging fruit...Today! If that happens repeatedly for enough iterations, suddenly the competition will start to succeed and outperform. The undisciplined business will miss out on customers and opportunity. Never ignore low hanging fruit.

Invest In Current Equipment

Many manufacturing environments are filled with technically gifted people. The temptation for many of them (myself included) is to be dazzled by the latest technological offerings. Many manufactures wrongly think that if they could just acquire the latest piece of equipment, that their problems would be solved. One of the surprising ideas which is prominent in sales training today is almost all purchasing decisions are emotional driven. Since manufacturing businesses are comprised of people, that same idea is applicable. In a manufacturing environment there are always calculations, presentations, ROIs, and projections to justify the purchase. Rarely are these tools used correctly. Most of the time they are simply manipulated to justify an emotional based purchasing decision. Executives and owners don't like to hear that fact, but it is the truth.

A better course of action can often be found by investing funds into existing equipment. What improvements can be made to the existing equipment to make it produce better quality, at higher production rates, and more reliably? Upon the occasion that new equipment must be considered, questions should arise centered around how the new equipment will work with the existing workstations and process flow. Many manufacturing facilities find themselves having installed new equipment and technology only to find their initial problem statement was never really addressed. Instead, their "problem" simply migrates to another location in the facility or creates a new set of issues. "Solution? More equipment purchases!"

Quality Focus

Many manufacturing corporations became obsessed with quality while it was in vogue back in the late 1990s and the early 2000s. There were a great number of businesses that flocked

to the 6 Sigma idea which was developed for Motorola by engineer Bill Smith. The pursuit of quality is not just important for the sake of brand reputation and customer retention, but it is fundamentally important to profit. Finished goods which cannot be sold is a huge cost. Rework of finished goods can often dissolve the entire profit margin of the product. Increasing the amount of finished product that meets quality standards is a great way to reduce expenses. Such an idea is not a notion that should be utilized only by large scale manufacturing. A focus on quality should be present in every manufacturing environment no matter what its size. Tight quality controls and the ability to produce product that can pass such high standards leads to less rework, less expense, better production output, increased brand loyalty, and better profit margins.

In summary, every owner or leader in a manufacturing environment should have a thorough understanding of their financial statements. Developing an inquisitive nature when evaluating financial statements is a trait that will prove profitable. Revenue is king. Looking for new and inexpensive ways to boost revenue while maintaining current operations should always be occurring. Reducing expenses is a worthwhile effort, but should be done with careful consideration, and only after all other improvement opportunities have been attempted. For the leader that can act upon these ideas, great things await their company.

Chapter 2 – General Hiring

Acquiring the right employee is a struggle for every business leader. This statement proves to be even more valid in the manufacturing environment. Over the past three to four decades, corporate group think has championed the virtues of specific traits, accomplishments, and metrics that hiring managers should seek in employees. Countless seminars and leadership ideologies have made their way to the marketplace. HR departments in mass have bought into the idea of the next shiny object. Human nature has not changed over the past 6000 years, so why is the marketplace flooded with new methodologies and training agendas promising to turn subpar employees into super employees?

The answer to that question is simple. Businesses who sell hiring products and training are selling their wares to make a profit for themselves. Such enterprises would not have any success selling such products and services if the base problem they claimed to solve didn't exist. That root problem can be summed up in one statement. People are dynamic, unique, and self-thinking. This reality explains why employees are difficult to work with, and why most managers are poor at holding people accountable. The employees are not perfect, and neither are the managers in most business environments.

The news is not all bad. There is truly a silver lining to this cloud. A change in the behavior of management can echo throughout a business if it is functioning properly. The front-line manager cannot change his employees easily, but he can change himself. Addressing self properly solves 50% of most relationship problems. If management starts worrying about working on themselves, whom they have direct control over, then changes in employee behavior will follow.

Another avenue that management should consider is hiring the correct employees to begin with. Sadly, this rarely happens. Most hiring managers do not think critically about how they go about sourcing talent for their organization. Instead, these managers simply follow standard industry convention. The only way to achieve different results than the rest of the masses is to take a different approach than them. That premise is often ignored.

What does the standard hiring process look like? See if the following looks recognizable to you?

See a need for another person within your manufacturing organization.

Write a list of duties you would like them to perform.

Try to find a job title and job description that matches what you truly need as closely as possible, just so you can figure out what to pay this future employee.

Post a job on three different job boards.

Receive 100 resumes.

Cast out the 80 that are unqualified.

Try to figure out who the “stand outs” are between the last 20 because they all look the same. Even to point that you start to get confused about who is who. “Was that Stacy or Stephanie that went to that sales training course?”

Schedule interviews with three candidates.

Interview two because the third one dropped out.

Schedule an interview with your fourth choice, but they cancel because they got another job offer while you were conducting interviews. Rinse and repeat this step two more times.

Final receive a third candidate after going to your seventh choice.

Conduct all three interviews, from which you are truly disappointed and simply just settle for the least bad candidate because you are sick of this process and have better things to do.

Outcome = Receive an average employee.

The process outlined above is common across many industries, especially manufacturing. It is “tried and true.” It is familiar, predictable, and everyone is comfortable with the process despite the mediocre results that it yields. The only way that an employer ever receives a truly standout employee through the process illustrated above is by accident. Kind of like a squirrel finding a nut cash that some other squirrel buried and forgot about. If this process is flawed, then why does it keep getting perpetuated?

“That is the process that large fortune 500 companies use.” “How else am I supposed to hire folks?” “My HR team told me that is all I could do?” Sometimes in life people walk around with ideas such as these, and call them “reasons” which gives the ideas just enough credence to be treated as facts. All the while not knowing that those same ideas are really nothing more than excuses, and therefore by nature, falsehoods!

Since the hiring process outlined above is so prevalent and so entrenched in the minds of today’s business leaders, it is difficult to prove how flawed the process truly is. Below, each step in the hiring process will be evaluated, to highlight the problems hiding in each of them.

See a need for another person within your organization.

This stage is where many business owners and managers make their first mistake in the hiring process. They see a need for more productivity, and immediately think that adding another employee is the solution. Why?

Why do so many employers see hiring another employee as the best solution for an existing productivity problem? The answer stings! Rarely is the solution of hiring another employee ever offered purely from a well of logic. The decision maker in such an instance will always defend him or herself by stating that their decision to hire another person is strictly facts based and is fully guided by the data, but usually that decision is guided more by ego, or laziness.

Ego speaks and sounds like this. “Man, if we added one more employee, that would bring me to having over 50!” “Then when I tell people about what we do here, I can say that we have over 50 employees!” That statement sounds ridiculous when it is read in print, but people truly allow that sort of internal dialogue to take place, even if they are ashamed to admit to it. Owners, executives, managers exhibit a natural inclination toward strong and domineering egos. That is evident by the fact that owners, executives, and managers possess enough ambition to assume the leadership positions that they currently hold. It is for this reason that those in leadership positions must maintain a watchful eye toward ego attempting to make the decisions.

When a business leader suspects their company has a need which can only be met by the addition of another employee, there is usually a selfish reason behind that conclusion. The reason their mind gravitates toward hiring is because that activity (as awful as it is) is simpler and easier than the alternative.

Exclaiming that “we need another employee” is easier than asking “Is there a way our business could reorganize and redistribute the current duties/tasks?” The alternative to hiring an extra employee requires asking some tough and uncomfortable questions. Hiring a new person is just easier.

For the business leaders brave enough to consider not hiring another employee, what sort of questions should they consider?

“Does any of my current employees have any bandwidth?”

“Do I have any employee willing to take on more responsibility and more workload for an increase in pay?”

“Is there a way I could reorganize the job duties within my business?”

“Do I have the wrong people doing the right things?”

“Are my employees doing what they are gifted at?”

“Do I have the wrong employees entirely? Should I replace instead of add?”

Those brave business managers who dare to ask such questions usually walk away with answers. Sometimes, those answers prove to be surprising. Once such inquiries are made, it starts to become clear that shifting around some number of employees is required. Almost every organization could benefit from asking themselves if employee realignment would be beneficial.

To be clear, what is being proposed in the preceding paragraphs is a measured and complete evaluation of the existing workforce. It is looking at the needs of the company, the talents of the employees, and placing them in the correct positions, while providing them with the correct training, accountability, and pay. Employee realignment will require work on the

front end to figure out “What to do?” On the backside of such a project resides even more hard work in terms of training and accountability.

Training, accountability, and pay all need to be addressed. Training in many manufacturing environments is poor at best. Usually this consist of a few slide decks with pictures, shadowing another operator or technician for a few days, then releasing the employee out onto the plains of the Serengeti. “They will figure it out!”

Well, they may actually not figure it out, and if they do, the knowledge will come at the expense of company profits!

This is wrong for a myriad of reasons, so many that another book could be written on that subject along. Yet, it still exists everywhere. Most leaders in the manufacturing space today seem to enjoy complaining about the condition of the current labor market. “The people are unmotivated!” “The people are unskilled.” “The people have no ownership.” Owners and executives setting around complaining about the condition of the labor market does nothing to change the labor market. Every manufacturing facility must fish in the same pond, so if the fish are week and small, perhaps it is time the corporations start feeding the fish. Building a complete and robust training program pays for itself in short order. The standards that can be passed down through a good program are superior to Joe who learned from Greg, who was taught by Frank.

Holding employees accountable does not have to be a rigid, suffocating micromanaging process. However, it does need to be measurable, simple, and demonstrate trust in the employees. Expectations should always be clearly set. These accountability structures will look different for each business, but they do need to be in place.

Employee compensation is area that most companies could improve in. It has been clearly demonstrated that almost any organization, business, or department would be better off realigning their current employees and paying them more rather than adding an additional employee. Examine the following common response. “I can’t just tell Greg, whom I have known for 15 years, that I will increase his workload. I might have to pay him more!” Why is there such a reluctance toward paying current employees more? Does familiarity breed contempt? Does a prophet receive honor except in his own home? That is exactly the reason. Such companies usually will have no problem adding additional workload to an employee, but extending that extra pay would be akin to cursing one’s own mother.

Most owners and managers would rather spend \$150,000.00 annually on an additional employee they don’t know rather than compensate an existing employee an additional \$30,000.00 annually in exchange for more work. These same business leaders do this knowing that they are jeopardizing the entire dynamic of their employee group by adding another person into the mix. Listen to the following excuses:

“This person truly needs to be focused on these duties.”

“We need someone with a special skillset and tact for this position.”

“This is a leadership role which requires a college degree.”

Such refrains are common in today’s business climate. Does that make these excuses valid simply based upon their commonality? Consider that first excuse listed previously, “This person truly needs to be focused on these duties.” Is that true? In most instances the answer to that question is no. Does a manager ever truly know what an employee is capable of when challenged? Most of the time managers do not know because they never challenge their

employees properly. The employee does not need to be focused only on a certain set of duties, but rather focused on utilizing their efforts to assist in producing as much product per unit of time as possible. Yes, certain tasks are essential, but are all of the employee's assigned tasks "critical?"

One of the major root issues that lie under the surface when the "This person truly needs to be focused on these duties" excuse is rolled out is that a manager is uncomfortable holding his employees accountable to the tasks that he has assigned to them. The defense is not for the employee's benefit, but rather for the manager's benefit. It is human nature to act upon self-interest. The manager fears finding himself in a position where he may be forced to discipline an employee more than he fears the employee will fail. Such fears are usually built upon a lack of comfort with confrontation.

Those who find themselves uncomfortable with confrontation should not be ashamed, nor should they ignore that characteristic about themselves. These managers need to acknowledge that trait for what it is and understand they have a propensity to act in a certain way towards their employees. Nevertheless, it is possible for managers to have tough conversations with employees and the dynamic between the two parties remain agreeable. People are able to accept reproof if presented in the correct manner. Employees are able to rise to the occasion. They will not melt and they will not die. Usually when such confrontation is done properly, employees and teams become stronger. What is the alternative? To do nothing? To accept the excuse and just add another person? Does that seem like a reasonable course of action in light of what the root problem truly is?

The next excuse that needs to be silenced is the one "We need someone with a special skillset and tact for this position." Is that really true? Is a special license required? Do you have

to have a certified public accountant, or a professional engineer to fill a specific position within the company? If there is no legal requirement for a licensed professional to fulfill certain roles within the business, then this excuse often turns out to be weak. Due to the public's exposure to technology over the past three decades, almost every employee that would be considered for a position within a company possesses a working knowledge of spreadsheets, filesystems, and email. Furthermore, there are very few technologies or software programs which are truly difficult to learn if given adequate training and time. For the business that is looking to hire staff that will be operating within an office environment, utilizing this excuse is quite ridiculous.

There are occasions where certain skill sets are required. A manufacturing company may be in need of a skilled machinist. In most cases such a need would require an outside hire. However, perhaps there is a 28-year-old man working on a production line who has been itching for some overtime and training on that new CNC machine. That scenario sounds unique and far-fetched, but it is actually more common than you might think. If a young man is starting a family, then adding skills and acquiring overtime is usually a common desire. Most businesses will never acknowledge this opportunity. Training this person, whom already works for the business will require expense, time, and a great deal of effort. Schedules may have to be rearranged, costs will be incurred, and then that employee will and inevitably leave.

The employee will not inevitably leave, unless there is reason too. Raise his pay!

Why would a business take a loyal employee who is already working for them, train them up with a new skill set, and then simply offer them the bare minimum pay increase to stay on board? That happens all the time. What should occur is this loyal employee who desired the additional training and was willing to sacrifice their time in exchange for the training should be compensated properly. In fact, this employee should be compensated so properly that they never

leave. Placing golden handcuffs on employees whom a business has spent much time and treasure on training them is an option. The manufacturing company will rarely find a better scenario than pulling from their own well of talent. These individuals already understand the company. If the company deliberately chooses to invest in them, a sense of loyalty will start to be built. The employee becomes more valuable, for a myriad of reasons. Such an employee's value could not be replicated by an outside hire.

That common catch phrase that "This leadership role requires a college degree" is quickly becoming obviously ridiculous. This was not always the case. The university system in America has enjoyed the benefits of a great marketing campaign which has secured its place in the collective psyche of the public. The university degree has become a necessity of civilized life. So much so that perspective students attend college to "not become something" (an "awful tradesman") rather than pursue a career (mathematician, etc.) For the past several decades perspective college students have been inundated with the mantra that a college degree is a necessity to have, and without such a degree, one will be unable to obtain a good paying job or be able to support their family. "University is a necessity in order to obtain the required skills to excel in the workplace." How about this one. "A college degree shows employers that you have what it takes to accomplish something."

At one time in our recent past, such ideas had merit; however, that has changed. The university system has become a place that extracts wealth from its customers through the use of government backed loans. Yet, it continues to offer an education that is diminished. The western university is continuing to offer a product that is progressively worst in quality, while also becoming more expensive. Employers are starting to notice. The average university graduate of

today cannot formulate arguments or think critically when compared to a university graduate of 50 years ago. Anyone who has read the “Great Books” understands that difference very well.

A perspective college student might be better off considering a career in sales or pursuing sales training while obtaining a degree. Anyone who has spent at least 20 years in their working career has noticed the link between revenue creation and personal income. A good salesman in almost any field can out earn a college educated counterpart. Car salesman, loan officers, and real estate agents can all earn large incomes without a degree.

Whenever this subject arises in conversation, I routinely challenge individuals to proceed with the following exercise. My suggestion consists of them conducting research on the internet to find a copy of an old high school entrance exam from the 1800s from anywhere in America. The challenge then is extended for that person to find someone they know that could pass the exam. With so many undergraduate and graduate level degrees, surely a high school entrance exam would be no challenge to the modern educated mind! It turns out the modern educated mind is weak and anemic. Upon contemplation of older exams, it becomes clear there is something terribly wrong with the education system of today. Imagine the tuition, room/board, and administrative fees it requires to obtain a level of undergraduate and graduate level education, yet it is not even on par with what an 8th grade education was 150 years ago. There are other examples. One could pick up any book written in the late 1600s to early 1700s. Most of us would find such works challenging to read, despite the fact that the style and tone are similar to today's published works. Where is the ROI on the college investment? The value is not inherent any longer, rather its existence is only based upon a collective belief in which fewer and fewer people are subscribing to. Even if they refuse to admit it.

Once I had the opportunity to witness a company pass on hiring proven talent. I was working in an engineering department for a rather large global manufacture. The company decide to hire a mechatronics intern. She was a young woman who was still in school and was seeking a degree program which was not ABET (Accreditation Board for Engineering and Technology) accredited. When she started her internship (which lasted for a period of 8 months) she was placed with the powerhouse manager. This was the at the beginning or her internship in May. During the summer, the powerhouse manager left the company. The amazing thing was that no one really noticed. It took the engineering floor several weeks to realize what was occurring because the transition was so smooth.

One day, I remember asking “Who is taking care of the powerhouse now.” We all looked at each other and realized that it was her! This young woman was managing the employees, scheduling maintenance activities, and overseeing projects. Upon this realization, I remember being very impressed and I wasn’t the only one who shared the sentiment. Consequently, several of us in the engineering department approached our managers and implored them to extend an offer to the young woman for the position. We were quickly informed that such an offer of employment would not be possible due to the HR department only accepting accredited degrees for the position. Her degree wasn’t accredited, thus even if her degree had been completed, she still would not be eligible for the position. A crime against common sense.

Anyone who has researched the amount of six figure jobs available to non-degreed persons in America can attest to the fact that the number of such opportunities is growing. Some of that growth can be attributed to rises in inflation, but most of that growth can be attributed to the adaptation that many employers are already embracing. There are certain trade unions which are starting to take great strides in education. Many technology companies such as IBM,

Microsoft, and Google are offering certificate programs. Many students of such programs can complete their courses in a fraction of the time, and for little cost in comparison to a normal college degree. The amount of pay available to people who take these alternative routes is usually quite competitive and sometimes greater than the average college graduate. The larger technology companies are realizing this. The college degree is not needed to be successful, therefore they are no longer requiring one as a condition of employment.

Moving on to other questions that business leaders should be asking themselves before hiring new employees, “Is there a way I could reorganize how I split up the job duties within my business?” Most managers do not enjoy facing that question. Often because the answer may prove that the manager has been managing his or her employees poorly. People will not usually pursue truth if they suspect it might threaten love of self. Upon reflection of the above question, will a manager find that 8 hours of work is being wasted among five of his direct reports? What does that mean? How long has that been going on? Will such a discovery change the way that he treats his employees? If the manager holds them accountable, will it change the dynamic in the team? Will those employees leave?

The short answer to all those questions above is... it doesn't matter. The task of a manager is to be a good steward. It is to maximize the labor and the assets given to him to optimize the amount of profit that his small kingdom can generate. The duty to that idea should be greater than the doubt ridden questions which arise from the discomfort of holding employees accountable to expectations. Attempting to make one's department or business the best it can be with the amount of individuals already employed is great for the business, and subsequently great for the employees and their families. It is selfish for managers to prioritize their own discomfort over the needs of the whole group.

Managers that suspect that their team may experience short-term hiccups due to them starting to hold their employees accountable need to simply get over it! There will always be short-term hiccups when change is afoot. Changes are needed to achieve different results.

There are additional questions that managers should consider before adding new hires to their organization.

“Do I have the wrong people doing the right things”

“Are my employees doing what they are gifted at?”

“Do I have the wrong employees entirely? Should I replace instead of add?”

There are many businesses that could benefit greatly from taking a few hours and really considering how they go about hiring talent. Below is an imagined story to illustrate the concepts behind the questions listed above.

Bad kitty guitar pedals extended to Bob an offer of employment eight years ago. Bob knew what his task would be due to the conversation which occurred during the interview and subsequently decided to accept the offer of employment. Both parties understood the nature of that transaction. In exchange for currency, Bob was going to sell his time, talent, and effort to his employer. Three years later, this same manufacture hired a young woman by the name of Cindy to complete another set of task that was completely unrelated to Bob's.

As of late, Bob has really been trying to learn the investment game which has spawned an interest in financial statements. Cindy just had a family member that required a little financial help, and therefore could really use some overtime. Everybody knows Bill could leave anytime,

but he really needs the money, so he hangs on. The company itself is doing well, and is at the point that the owner is considering hiring more employees.

One day the owner of Bad Kitty came in to address the staff. He instructed them to all write down their task (daily, weekly, monthly) on a sheet of paper. Afterwards, each employee was instructed to write down each individual task on a post note and stick them to the wall of the conference room. The owner then proceeded to inform the employees that they had one week to study the wall and to consider which duties they would like to have.

After the week had past, all of the employees that participated in the exercise came in and set down. Each employee, one by one, would walk up to the conference room wall and take one of the post it notes that they desired. This was repeated as many times as required until the wall was clear of the post it notes.

What sort of consequences would result from such an action? Would employees that who chose their job tasks be more productive? Would each employee become more rounded and capable in terms of their individual contribution to their employer? Would cross training become a necessity instead of a talking point? Would the business become less fragile in the future due to multiple employees being able to accomplish different tasks?

Since people's circumstances and interest change as they go through life, why not take advantage of those shifts to better the business. Many employees are bored of their same task each day and would welcome a new challenge. There is always hidden talent, and some of it is walking through the door each day. Ideas such as these are risky and bold. The questions are tough, and few are willing to ask them.

The next thought step that is often encountered by an employer when considering a new hire is *“Write a list of duties you would like them to perform.”* This step leads to hiring decisions based upon the number of tasks that need to be accomplished and not the number of employees or people that are required. There is a different attitude of thought when it comes to considering the number of tasks rather than the number of people. When businesses are small, their operations are not always in the best financial shape, thus requiring owners and managers to carefully consider each hire to ensure that the additional person is truly needed to complete all the necessary tasks. This practice usually diminishes as organizations become larger, additional layers of management are added, and financial conditions improve. Care must be taken in every business to maintain the same level of scrutiny at all times toward hiring as was originally present during the start of the business.

Going back to the list of hiring steps, the next item to address is *“Try to find a job title and job description that matches what you truly need as closely as possible, just so you can figure out what to pay this future employee.”* This is a tragic reality.

Our current attitude toward business has lost the ideals of capitalism and has wandered off toward the siren of greed. This has led to society and businesses reducing the employee into a commoditized item. Most businesses shop for employees as one would shop for a car or cattle. HR professionals hire and interview resumes- not people. This has occurred due to confluence of labor market conditions, government intervention, and technology. It is difficult to point the figure at one bad man.

How should the average employee navigate such a job market? Employees no longer wake up early and knock on the door of a business to see if they are hiring. Even if they did, the

business's front receptionist or security guard would tell them to leave and visit their website so that they could submit their application. I know, that has happened to me.

So why the need for the job title conformity, and the pay structure? The answer to that question is because most employers don't know how else to advertise their open positions, nor how much to pay. That means that most hiring processes of most employers are built upon them not knowing how they should go about hiring someone, nor what the position they are hiring for is worth to the company. A rather shocking realization. Why do so many HR departments fail to have creative ideas about how to acquire talent for their organization, isn't that their job? How is it that finance departments and industrial engineers can so confidently forecast ROIs and true depreciation values vs taxable depreciation, yet no one in the western world has a true understanding of what a position is worth to a company on a financial basis? Is the math too difficult? Why does the position that one company advertises for have to match the description of everyone else's?

Most businesses are not unique, and manufacturing businesses are usually no exception. There is a reason every town has multiple restaurants or various lawncare providers. That reason is usually based upon the idea that such business models are proven and with diligence can become profitable. Just because there are similarities in different companies does not necessitate that employee positions should be the same. Since most manufacturing processes in a given industry require the same raw materials and equipment, the way workers tasks are distributed may be one of the few ways that a manufacture can obtain a competitive advantage. Making the job description for one company match a similar job description that is commonly seen on the internet is not required, and HR departments should stop trying to match the masses.

One of the worst aspects of this type of behavior is on display in job postings is the required experience and education. Almost every HR department and company tries to match each other in this area, with not having a good explanation as to why they do it! Why does that management job require a BA in business? Why does this position require five years of experience? The reality is that most positions do not require a college degree or significant experience. The only reason such requirements exist is because most employers have failed to devise a better way to screen the prospective employee's abilities other than what they have already demonstrated for other employers in similar environments.

Most of these actions can be summarized by the fact that the employer is uncertain as to how to hire the employee they need. That is why most job postings look so similar. Employers are just copying each other trying to find relief for their problem, rather than carefully thinking through the best way to solve it. Most business don't know what tasks their perspective employee should be performing, nor what those tasks would be worth to the company.

Manufacturing operations should tackle both problems. First, such organizations need to have honest conversations about what each position should look like in their organization. Next, these companies need to discover the financial ROI of each position. Pay structures predicated upon contribution ensures that the best talent is placed where it is needed most.

Anyone who has surveyed websites displaying financial metrics of publicly traded companies is familiar with the notion of revenue per employee. That is certainly not a bad benchmark to keep an eye on. But it does not lend itself well to hiring decisions. Here is why.

If a company hires three salesmen, the company's revenue should have an obvious boost rather quickly if the salesmen are any good. Since these extra hires bring in additional revenue

quickly, their impact via revenue per employee metric is obvious and easily seen. Contrast that scenario with the product engineer whose time is going to be spent designing new products and improving the design of current offerings. This type of employee would diminish the revenue per employee metric for a great deal of time. Their contribution, however impactful and necessary, will never be positively translated into such a metric as revenue per employee. Such employees are a constant drag on the ratio. If owners and managers were to pay too much attention to such a measurement, it would dissuade them from hiring anyone who did not directly contribute to top line revenue. Even though the revenue per employee is a good measurement for company-to-company comparisons, it is a terrible metric to utilize when hiring.

Few employers ever use such metrics when making hiring decisions. Nevertheless, an employee's proximity to the revenue line does have a direct impact on his/her salary in almost every field. Most employees that are engaged in sales activity enjoy the benefit of being able to easily demonstrate their impact upon their company and as a result, usually are able to enjoy commissions or bonuses proportionate with their contributions. In racing there is an old saying "There is no replacement for displacement" obviously referring to the amount of space available within the combustion chambers of an internal combustion engine. The same rule usually applies in business. There is no replacement for sales.

Other employees who are not engaged in sales activity usually prove more difficult to properly compensate. This is due to the way their contributions are evaluated on the income statement. Ponder upon the bookkeeper, or the quality engineer as an example. Their contributions are essential, but their salaries fall squarely within the expense category of the income statement. Their contributions, however necessary, are obtained at the expense of bottom-line profits. That is one of the reasons most Certified Public Accountants, Corporate

Lawyers, and Professional Engineers have such tight salary ranges per their respective field. The quality of their output is backed by the licensure of their profession, thus assisting employers in the realization that their manhour is a commoditized product. For the business requiring a PE stamp or drawing, or a CPA to prepare last year's taxes, the licensure is what is being paid for, and it provides the liability shield that the business is wanting to secure. Therefore, one PE is just as good as another PE, and all CPAs are "equal." This leaves many licensed professions with no other way to compete other than with price.

I often get the opportunity to speak with engineering students that are currently participating in their first or second internship. When they ask for advice, and I share with them the facts that I just laid forth.... they don't understand. They will in time.

Since revenue per employee is a poor metric when evaluating employee impact, what other measurements might be valuable? How should the local manufacturing facility decide if it should pay Bob \$200,000 a year or \$90,000? It has already been proven that basing pay upon whatever everyone else pays is a poor idea.

When trading with others, parties only exchange items of less value for items of more value. The only reason trade and transactions ever occur is because there is a difference of opinion as to what is valuable in the minds of the parties participating within the transaction. When an employee agrees to a salary, that employee is stating, in their opinion, their gifts, talents, and time are worth less than the salary amount that they are agreeing to receive. That employee would rather have the offered salary (which in their mind is of more value) than their talents, gifts, and time being employed in ANY other work on the face of the Earth than the one that has been offered them. That is the true nature of the employee side of such a transaction. The employer side of the transaction is simply the counterparty to that transaction. The employer

believes that the talents, gifts, and time of that employee is worth more to the company than the amount of expense that they will realize via paying the salary. Employers have a higher view of an employee's gifts, talent, and time than the employee does in most instances.

Why would any employer ever fear lowballing an employee during a salary negotiation? Why would a perspective employee ever be nervous in asking for more money? Would it be unreasonable to ask a perspective employee what they would like to be paid? If the previous argument is factual, that salary amount for which the employee is willing to exchange their talent and time for is already a known variable to them. If a company offers more than that number, the employee will stay, if less, then the employee will leave. Wouldn't it be easier to just cut to the chase?

Imagine creating employment positions based upon what tasks are needed versus what are popular or commonly done within the manufacturing environment. Imagine hiring the people that were the best fit, instead of the ones who presented the best resume. Then imagine paying whatever it took to get the right people. Would such a company look different?

Job Boards

In the Bible there are many examples of wealthy patriarchs who possessed large quantities of servants. In such cases, large numbers of servants would have been necessary in order to take care of the amount of livestock that was owned by these men (Think of Job or Abraham.) Now obviously slavery and servitude looked different in ancient times. Many people would sell themselves into such positions to survive. There were no factories or office buildings to work in. Businesses were built around the home and families. So unless one was a part of a family or worked for one, one had better be a skilled craftsman, sailor, or merchant. The only

way one could be a good steward of wealth was to have enough servants to make use of the assets under one's command. That idea is the main premise behind the classical Greek work *The Economist* by Xenophon (a worthy read.)

If servants were so valuable and necessary, how did ancient patriarchs go about finding servants? How would someone from 700 B.C. advertise a job position? Obviously, the internet and local newspapers didn't exist. Other methods would have had to be used. A good exercise for owners and managers to engage in is to think about how they would go about filling a position if no newspaper, or internet was available to them. No technology beyond 1400 AD. (that way we eliminate the Gutenberg press. Billboards and colorful signs existed in ancient times...so those are still available.) Someone who completes this exercise may discover answers such as "From word of mouth." "Similar positions in other industries that pay less." "Recognize talent in everyday life and meeting new people." "Build a training program so good, you could hire a cat and make them the employee you wanted." Any of those answers would be good and there are many more. Our human nature creates in us a tendency to take the easy road when presented with the option. That is why these job boards, and the internet seems to have dominated the hiring process. However, the job boards and modern technology only enslave the willing. For those who wish to see different results, different methods are often needed, and luckily, in this instance, different methods are only limited by one's creativity.

Resume Review

Modern etiquette surrounding the art of resume writing states that the length of resumes should not exceed two pages and should be formatted to look as similar to other resumes as possible. This concept is absurd. In an effort to find the best talent for a role, candidates are required to limit the presentation of their achievements and attributes to just two pages, in

addition to making a concerted effort not to stand out in regard to their writing or presentation. Thankfully, some fields are requiring CVs, but that is usually limited to only academia, law, medicine, etc. If the injury was not enough, the insult is usually added by HR departments requesting a cover letter in addition to an application and a resume. This cover letters also appears to be pointless and irrational. Since no applicant would voluntarily present to an employer the fact that they are not the best applicant for the position within their cover letter, then where is the benefit in receiving one? Are they not all an unwilling and non-malicious lie? Even the candidate that is selected isn't the best, based upon the logic of there always being a more suitable candidate who did not apply. Thus, every cover letter that states "pick me, I am your best candidate!" is a lie, and that is true even for the candidate that is chosen to fill the position.

It is no wonder that the employment application processes have become automated via software. Many large corporations have HR departments who simply cannot facilitate 120 resume reviews for 209 positions each month. That would be the equivalent of 25,080 two-page resumes that all look the same. This is a pain point for many corporations, and it creates the opportunity for third party software providers to sell a product (hopefully on a subscription basis!) to these corporations. While these automated software systems may indeed create benefit for the employer, they are hindering them in some respects.

When a potential applicant encounters one of these third-party software systems, they are often presented with a request requiring them to upload their information and input that same information in several different places. For potential applicants who already waste and inefficacy, they become frustrated and neglect the process. There are those who may make the argument that such a process will filter out the lazy and uncompliant applicants, but it does so at the cost of

filtering out talent that will not stand for poor decisions. This later group is exactly the sort of employee that a company should be seeking.

This entire resume review process is flawed, yet it remains unchallenged and is allowed to exist since there is not enough impetus to overthrow it. Most businesses evaluate resumes by simply selecting the top three or four candidates and conducting interviews with them. Below is a suggestion of a different way. It is not the best, but it may inspire some businesses to try something different.

Since resumes are the order of the day, and most owners will not get around having to sort through a pile of them at some point, this method is built around the use of them. It utilizes a quasi-statistical sampling method to group the resumes and sample the contents of the group. It is important to remember before trying out this method, that the goal of the interview process is to find a candidate that is teachable and can successfully fulfill the tasks of the job with a good attitude. Employers whose goals for a perspective employee that extend beyond that metric risk missing out on some great talent. The college major and GPA is not always an adequate measure of a person's ability to do work. Attitude trumps experience and education every single day.

Instead of simply picking the top three or four candidates from the entire stack of resumes submitted for an open position, a hiring manager would group all of the resumes into piles. There should be three piles that are sorted into top, mid, and bottom tier. The next part of the exercise would be to extend phone interviews to five random candidates from each of those three piles. Remember, these interviews are searching for teachability and attitude. When completed, there will be 15 interviews to evaluate. Some managers may be surprised at the conversations that they have, and would have missed out on had they not sampled those whom they normally would have overlooked.

Adding Additional Employees

Before any employer adds another employee to their organization, they should really consider all of the potential consequences.

Anyone who has spent a significant amount of time in corporate America can attest to the concerted effort of many managers to lecture on the idea of “fostering culture.” While many such managers are insincere and simply repeat talking points that they hope will help them secure a promotion, there is some elements of truth to the idea. Culture within the workplace is important and is also fragile in most instances. The dynamic that exists within a team is usually predicated upon two things. The first is the leadership that is demonstrated by the manager and the company. The second would be the character and attitude of the employees. If a company ever begins to experience poor leadership, or if the attitude of its employees ever becomes sour, then the culture will begin to degrade quickly. Often to such an extent that performance is affected. It is often difficult to correct those areas once something goes wrong. One bad apple can spoil the whole bunch.

For anyone who is inclined to ascribe truth to such an axiom, then there also must be truth in the fact that adding an employee to an existing team involves risk. So much risk that the entire dynamic of an existing team can shift. These changes can be positive, but in most cases the risk usually tends toward the negative side. If the employee turns out to be overly critical, and complains about everything, that behavior tends to catch like wildfire, particularly in technical departments. Complaining is always harmful to a group of people, just reflect upon the Israelite camp in the wilderness after they left Egypt.

Complaining is just one possible attribute that could change the dynamic of a team within the workplace. There are obviously many other aspects that constitute the interactions between employees. There are relationships that form between employees. Modern society has somewhat limited our definition of relationships to those that are a part of our family or romantic interest. Nevertheless, the broader definition of that term does include the repeated interaction between two people, which would adequately describe what occurs in the workplace each day. These relationships are often seen as cordial, and sometimes friendly, but should always be professional in nature. Most mature adults possess a sincere appreciation for how fragile and difficult good relationships are to maintain. That is the reason that very few people are seen going around simply saying the first thought that comes to mind. All relationships require effort, work, and sometimes self-sacrifice in order to endure.

Most owners and managers are unaware of the number of relationships that exists within their organizations. There is actually a mathematical equation that has been commonly known among practitioners of family issues but is less commonly publicized in the manufacturing world which states how many relationships exist as a function of the number of people within a group.

$$\text{Relationships} = (\text{People} * (\text{People} - 1)) / 2$$

Utilizing that equation consider the following list illustrating the output of that equation given different numbers of people within a group.

For 2 employees, there is 1 relationship.

For 3 employees, there are 3 relationships.

For 4 employees, there are 6 relationships.

For 5 employees, there are 10 relationships.

For 10 employees, there are 45 relationships.

For 15 employees, there are 105 relationships.

For 20 employees, there are 190 relationships.

For 25 employees, there are 300 relationships.

For 30 employees, there are 435 relationships.

For 40 employees, there are 780 relationships.

For 50 employees, there are 1225 relationships.

Wow! Who would ever think that going from 5 to 10 employees would create an additional 35 relationships. Consider the increase from 20 employees to 30 employees. That's an additional 245 relationships. Obviously once teams become sizable, the number of interactions between employees will reduce simply from the constraint of time, but the same premise holds true. Adding one employee can have a significant impact on a team's dynamics and can change the culture due to the number of relationships.

There is one other potential issue that needs to be addressed in regards to hiring additional employees. It is no great secret that those who live in the United States live and operate in a litigious society. There is always the potential that a new employee may cost a business owner more money than just the expenditure of the necessary salary, taxes, benefits. This is a fact that should give owners and managers pause.

Chapter 3 - Hiring Operations People

In most manufacturing facilities the operations department will be the largest and the most critical. Since the operations department usually has the most direct impact on the financial health of a facility, it is prudent to give special consideration to hiring employees in this area.

What is the purpose of operations employees? For most organizations the purpose should be narrow and clear. Operations departments should appropriately and efficiently utilize manpower, equipment, and material resources to produce the highest quality product for the lowest cost and in the most efficient way. Given that definition the task of determining what characteristics and operations employee should have should be easy. Below is a short list of some ideas. The business owner or manager should feel free to make their own list or add to this one.

They should be resourceful.

They should be creative and decisive.

They should be gifted at scheduling.

They should be good with people.

They should be good with equipment.

They should understand cost.

They should be undemocratic.

They should be able to accept and receive instruction.

Such a list seems relatively simple, but finding individuals with these characteristics within the labor force can prove difficult. Consider the trait of creativity and resourcefulness. These traits are usually desired within a manufacturing environment due to the dynamic and unpredictable nature that sometimes arises within a facility. When a schedule must deviate at 2 AM on a Sunday morning, operations employee needs to be able to think critically and consider all possible permutations and consequences of any alternative action that is considered. This character trait is usually not teachable but is one of those aspects of a person's personality which is innate.

When trying to ascertain if a perspective employee may possess these qualities, evaluating experience which has demonstrated creativity and resourcefulness should be very open in scope. Consider the front-line supervisor in a restaurant that has to make split-second decisions for their entire shift. There is the older brother of a single-family home who was responsible for working at an early age in order to take care of his younger family members. A dispatcher for a trucking organization will obviously have some stories that would demonstrate resourcefulness and creativity. When evaluating employees for these qualities the past experience does not have to exactly match that of the perspective manufacturing environment, but rather it is the trait of resourcefulness that a hiring manager should be looking for.

Scheduling is vital for a manufacturing facility. It has been my experience that individuals either possess this ability or they do not. There are software programs that are able to assist in this area and there are teaching aids along with courses. However, for those who do not naturally possess the gift scheduling, no software or course will ever give them that natural ability. The natural scheduler does not need instruction, they simply just see all of the moves

required ahead of time. All the moving parts and schedule exist in their mind, they just had to be able to communicate it to others.

These natural schedulers can be found in fields and industries other than manufacturing. They exist everywhere if one knows where to look. Below is a personal story that demonstrates that fact.

Many years ago I worked at a manufacturing facility. It was very common for me to go out and eat lunch in a restaurant most days. On one such occasion I happened to patron a pizza restaurant on buffet day. This experience was not new to me. I had frequented this restaurant before and was fairly certain that a lunch buffet would be served on the day that I visited. I was familiar with the layout of the buffet and what a typical lunch crowd would look like during the time of my visit.

Upon arriving I was greeted by a young woman who was serving as hostess. She immediately directed me to a booth and shared with me what offerings were currently on the buffet, what pizzas would be coming out next, and how long it would be before the new pizzas arrived. I had never experienced such prompt attention when being seated at this particular establishment before. Within the first two minutes of my arrival I had already become quite impressed with this young woman's work ethic and talent. As I waited for more pizzas to be placed on the buffet bar, I took notice of something else. This young hostess was everywhere. Within a matter of just a couple of minutes, she had managed to take more orders, fill my drink and deliver it to my table all while seating two other parties. There were no wasted steps as she navigated the dining room.

Other observations made themselves apparent as the lunch hour ticked by. I begin to notice that there were many more patrons than there usual and this young hostess was keeping up with the entire lunch crowd. She was not missing anything. Everyone who walked through the door received the same level of service as I did. No one's drink was ever empty. She was confident of her knowledge and spoke with authority about what would be occurring within the next ten to fifteen minutes. This event happened over ten years ago, and it is still impressive to me today. I remember thinking to myself "If I owned a business, today would be the last day that girl worked for this restaurant. Tomorrow, she works for me no matter what the cost." I went back to that restaurant three weeks later. The lunch crowd was half the size, and that hostess/ waitress was gone. I would like to think that someone else had the same idea that I did.

That young hostess had no need to sit down at a computer with scheduling software to figure out how to run that dining room so efficiently. The task was one that she could perform in her head with no written aid. She was a natural scheduler. She was able to perform tasks simultaneously, adapt to new inputs, and keep a pace of operating maintained for extended amounts of time. She was able to do this all while monitoring the changing conditions in the dining room and the kitchen. These are gifts, and it is easier to discover those who are gifted than try to teach those who are not. This young hostess could easily have been the lead scheduler at any manufacturing facility.

The majority of factory workers possessed mechanical and electrical aptitude in the past. The young man that was promoted to crew leader back in 1975 understood what a hydraulic system looked like because he had to work on one last week at his farm. Today, the average labor pool is not as gifted in that area. There are many contributing factors, such as having a larger percentage of the population growing up in metropolitan areas, the increasing use of

microcontrollers in lieu of electric-mechanical devices, and economic prosperity which has removed the necessity of having to work on one's own equipment. No matter what the reason, the fact remains that mechanical and electrical aptitude among the general population does not exist in the same quantities as it once did.

Most manufacturing employers have not admitted this is an issue. For those manufactures who do understand the issue, they do little to correct it. Everyone who works in a manufacturing facility should be able to walk up to a machine and understand, at least from a high level, how it works. "That big arm over there takes the material and feeds it into that sewing machine looking thing!" That level of understanding is sufficient for front office employees involved in purchasing and HR, but such understanding is usually completely absent.

Having operations employees who understand how their machines work is essential. One of the easiest ways to address this problem is to institute a shadow program. Under such a program, the manufacture would offer overtime to the operations employees. While on this OT, they would shadow for a period of two weeks a maintenance counterpart in order that they may learn how their machine functions. Most maintenance employees would welcome informed and caring machine operators who would raise concerns over upcoming issues rather than trying to break the machine so they could go to break early. Informed operations employees produce more product and tear up less equipment. An expertly crafted shadow program should be able to bring about buy in from operations employees, which will place more eyes on the equipment. This is an important step toward increasing machine reliability.

Operational employees who have a true understanding of cost and are cost conscience are also highly sought after. An operations employee will often be faced with competing interest. He may have to balance available manpower, machine downtime, and raw material cost all in his

head. Then the employee needs to take that data, make a split-second decision, and move on to the next decision. Such an employee may need to make hundreds of such decisions during a shift.

Most operational employees in the manufacturing environment do not understand the true cost of raw material, machine downtime, or opportunity cost that exists within their department. These employees lack of understanding is usually the result of apathy on their part, and a failure of their managers to teach what those cost truly are. Apathy within employees is difficult to overcome, but the sharing of knowledge is not. Unless there is truly some trade secret that should not be disclosed, then a culture which promotes the informing of employees should be cultivated. Unfortunately, there are many owners and executives who wrongly believe that they have discovered the “secret sauce” to building their product, and that they must keep their special knowledge within the hollowed halls of their manufacturing facility. Owners and executives who think in that way are almost always delusional. Unless a manufacturing facility is mining its own raw materials and making all of its own equipment, then anyone who wanted to recreate an exact operation could do so. Manufacturing is not a difficult science to copy. Informed employees are more valuable than worthless secrets.

Undemocratic Structures

In early 2010s, there was a movement across the Arab nations of the middle east known as the Arab Spring. Most of these armed rebellions and uprisings were supposed to have been organic and started from within each nation (that is the story we were told on the nightly news; Thus, it must be true.) But it was awfully curious how involved the US government became in every one of those conflicts. In many cases, the US military helped in removing dictators and attempting to install forms of democracy in those nations. Those democracies that were installed

are fairly weak today and weakness does not bode well, particularly in that part of the world. Very few people stopped to think why all of these Arab countries were governed by dictators. Every one of these countries had experienced different governments and empires for thousands of years, so why were the people so accepting of those strong (not necessarily good) dictators? The reason is because a dictatorship is required in those regions if stability is to be maintained.

If man could know what justice is, then justice would look the same everywhere across the centuries and in every nation, but it does not. Self-governance by a people for whom it is not possible to know justice, cannot govern itself effectively for very long. Thus, democracies are rarely a good idea. Democracies always degrade and are drug down by the depravity that is naturally occurring in mankind.

Looking at government structures can be very informative when evaluating organization structures within a manufacturing facility. That is because the organization structure within a manufacturing facility is a government (for those familiar with the first American colonial charters, that statement holds even more significance.) Any business is a collection of people which must be governed to produce and achieve a common goal. Now in a typical political government, the goal is to discourage evil, enact justice, and to protect the individuals' freedoms as much as possible. This requires a government to be arbiter when one man's freedom interferes with another. Anything beyond these mandates is outside the purview of a government. A business "government" is not much different. Someone is always in charge.

There are many parallels between the two ideas. A business "government" must be busy doing the following;

Making sure that the business is profitable.

Making sure managers follow guiding principles.

Ensure that employees are treated fairly and work at maximum efficiency.

Produce a quality product.

Making sure that the Owners vision is executed.

Now that sort of government is not a democracy. It has to be a monarch or a dictatorship. As long as everyone within the business understands what sort of “government” structure they are under, and the head leader is competent, then the business will usually run smoothly. Problems arise when the leader is not competent, or when the employees get confused about the nature of the structure in which they operate.

Leaders can get confused as well. Many owners or managers quickly become uncomfortable with top-down rule due to the culture in which we live, and as a consequence, may start trying to overlay aspects of democratic rule over an organization that requires a dictatorship. Signs of this occurring may take the form of the following:

Responsibility is given to managers, but authority becomes withheld.

Employees become accustomed to having a “say” and become hostile when those illusions are challenged.

It never goes well, just look at the results of the Arab Spring.

I once had the pleasure of working with a group of people that routinely recounted a story about a much-respected plant manager. This plant manager was in charge of a very large factory. In fact, it was over 40 Acres under roof, full of machines and warehouse space. This plant manager ushered in a time of prosperity and smoothens which had never been experienced

before his arrival to that position. It has also never been experienced since. Now this plant manager was special in the way that he “managed” his plant. He did not “manage”...he “ruled.”

The story was usually told as follows:

The plant manager would arrive at the facility every morning at 4:00 AM. He would then spend the next two hours walking the entire facility, starting at the beginning of the production process and ending at the warehouse which stored the finished goods. This time gave him the opportunity to speak with any night shift production worker he wished since their shift did not end until 6:00AM. His early morning presence also limited the amount of employees that felt it safe to shut down just a few minutes early. This plant manager knew how to interact with the floor operations and maintenance employees. He had a great understanding of the equipment, and he was naturally gifted at scheduling. After he had concluded his walk, he would then proceed to his office where he would write out by hand the schedule for the day shift. This was an impressive task given the product mix of the faculty.

He was famous for asking questions for which he already knew the answer. If a department manager failed to know the answer, then that department head heard about his lack of competence in a private setting. Under this plant managers leadership, not knowing the real time condition of one’s department was an unacceptable state of affairs. This plant manager ruled as a dictator, and the plant performed excellent under his leadership.

That story is not an isolated event, there are many individuals in the manufacturing space who worked back in the 1980s and 1990s that could tell similar stories. As humans, we are supposed to learn via stories. In the manufacturing environment, dictatorships work, especially when the right person is in charge. Major corporations do not favor such individuals for leadership positions any longer. Having independent thinkers who may tell executives to “stuff it

up your butts! You all are being stupid! I am not doing that at my plant!” is not accepted anymore. Blind obedience at the sake of profit is the order of the day.

Corporations need to drift back to dictator style leadership structures, and operational employees need to be accepting of that style of leadership. Hiring employees who are democratic idealist in respect to all aspects of life, or have an incisive need to be heard, affirmed, and comforted, are a danger to a work force. Business is war without the bloodshed. The only thing that bleeds in this war is cash. Weak businesses are filled with weak people. Weak businesses die. When hiring operational employees, make sure that they understand authority and rule.

Hiring operational employees can be a demanding task. It is imperative that the hiring manager consider attitude and special experiences when attempting to fill positions.

Chapter 4 - Hiring Technical People

Technical people are just different. Technical people are individuals who possess some form of specialized skill for which their mind is particularly gifted or inclined. They are quick learners, and often possess a natural aversion to people most of the time. To be clear, this does not make them bad at relationships per se, but it does imply that their natural preference is to avoid people if given the chance.

There are many other unique traits which commonly present within the technically gifted person. A few which require special attention. The majority of technical people have a very strong relationship with their ego. Consider this statement. Most employees work for money. Technical employees work for money and to protect their ego from getting harmed. Their ego is that important to them and is often a major contributing factor in the decisions they make. Observing a technical person accepting less money for another position which offers more benefit to his/her ego is not an uncommon occurrence.

Another aspect of the technical mind is I.Q. Most people would agree that technical gifted people usually present with greater than average I.Q.s, and that generalization would be correct. However, that reality has consequences which business leaders need to be aware of. Most technical employees are risk averse and due to the nature of their training, naturally gravitate toward negativity. Their success often requires them to think of every scenario in which something may go wrong, and subsequently design against those scenarios being able to occur. This ability is essential to them performing their jobs well. However, when this trait is coupled with their advance intelligence, it can often give rise to contagious negativity. Technically people have the ability to punch a hole in every single idea that managers can think of. Owners and

managers need to understand that they will always be judged by this group of individuals, which unusually possesses a higher I.Q. than themselves.

What has been presented here is not a bashing of technical people...I am one. It is a warning label. Technically gifted people are necessary in the world, but they must be approached with the above knowledge in mind. If business leaders are unaware of a group within their facility that are extremely smart and inclined to possess negative dispositions, then when they start trying to manage that group the result will usually be poor. This aspect of managing technical employees has created a stereotype which proclaims the technically gifted are usually “prickly” in nature. Such stereotypes coupled with the commoditized work hour creates a paradigm which encourages leaders to simply view their technical employees as “assets” or “tools” to utilize.

It is imperative that managers understand these aspects of character present within the technically gifted employee and utilize that knowledge to their advantage. The ego that commonly presents itself in the technical mind craves trust, and the technical person desires clarity. If managers can provide detail on what they desire, and trust the technical employee to accomplish the task, they will find those employees much easier to manage. Micromanaging in an atmosphere of ambiguity will usually lead to terrible outcomes and attrition with a technical group.

Many HR professionals may be aware of these realities on some level, but few use this knowledge to their company’s advantage. If the average owner went to their HR department and presented all of the warnings above concerning technical employees, the reception that the owner would receive would be littered with platitudes of “Oh, that is an interesting thought!” “You know, my cousin was an engineer, and that describes him to a T!” The moment that same owner

wanted to act upon the special nature of the technically gifted and start changing the hiring and interview process for potential technically employees, the niceties that had been previously bestowed on him via HR would cease quickly!

Why shouldn't the process be different? Perhaps it should!

When managers interview the technically gifted for a position, they need have established ways of discovering how the potential candidate acts in regards to his ego, and his tendencies towards negativity. These two aspects of character will usually be the most difficult to discern. For the technical person in the hiring process, they are usually presented with an embarrassment of opportunities to demonstrate their competence. That aspect of the hiring process is easily handled and will be addressed later, but it is the above-mentioned character traits that can be somewhat allusive, especially for managers who are ignorant of their need to discover them.

When attempting to obtain information about a technical person and their relationship with their ego, it is best to utilize a two-step process. First, ask probing questions, situational in nature, that would illustrate the truth about the ego, their desire for glory, and level of their enslavement to pride. Such questions can be clever and do not have to be overt. Allow opportunities for narration and open-ended responses. Trust that out of the abundance of the heart, the mouth speaks. Second, simply straight up ask the potential technical employee what their relationship is with their ego. People of a technical nature appreciate honesty and straightforwardness so long as it is presented tactful. Perceived falsehood, hiding of intentions, and fakery is rarely embraced.

There are ways to conduct the interview process that can assist in ascertaining the level of competence that a potential technical employee may possess. Hiring managers may find it wise

to include other technically gifted employees in the interview process, especially if there are technical competences in which the hiring manager is weak. Multiple benefits occur when existing technical employees are included in the interview process. The obvious advantage is that the existing technical staff will be able to ask the correct questions concerning the technical competences required to fulfill the position. The other benefit is the interview will give the existing technical staff the opportunity to screen the potential candidate for their communication ability and personality. If they find that the person is an absolute gifted genius, but is horrible to communicate with, then proceeding hiring in that scenario would be a poor decision. These conversations between the existing technical staff and the potential employee should consist of open-ended questions. Such action will give the hiring manager more information to consider when making their hiring decision.

Owners and executives also need to be leery of hiring large quantities of their technical employees from the same program or location. This can often present as hiring from the same military specialization or a common training school, perhaps a local university program. This type of hiring behavior typically manifests when a hiring manager stumbles across an exceptional employee from an institution, and thus proceeds to keep going back to the wishing well in hopes of finding another gold coin. When hiring managers act in this way, they are essentially tying the success of their manufacturing operation to the success of the institution from which they acquire their new hires. So long as the standards are upheld or improved, the issue is mute. However, the moment standards start to diminish at the training institution, the consequences of continuing the practice can become dire. The risk is too great. Why would anyone make the success of their facility over (which they control) dependent upon an organization which they do not control?

The term diversity has been really distorted over the past few years and that has caused many thinking people to ignore the term at all costs.

Finding wells with plentiful sources can sometimes prove difficult. It is usually wise to ponder on all of the different sources that a facility manager may have to choose from in respect to finding technical employee candidates. Researching various programs in and around the facility's location is always a good decision and that research should occur on a periodic basis. Asking existing technical employees to think outside the box and to come up with new ideas on where to look for new technical recruits is also a great idea.

There are many companies who chose to grow their own engineers. There are usually multiple avenues a manufacturing business may wish to pursue in this regard. First, there is the possibility of taking existing technical employees and enrolling them in an engineering university program. Allowing them flexible work schedules to work around their classes and paying for their education. This idea could be expanded to fit the needs of the business. Perhaps your technical workers would just need to take a handful of classes, or maybe they require an entire engineering degree. Whatever the requirement, paying for education that benefits the business is usually a great option. Tuition reimbursement programs are prevalent in corporate America today, and any manufacture of any size can start such a program while customizing it to fit their needs. If business leaders can keep an open mind as to what education is truly beneficial to the company, many possibilities exist. Maybe there is another manufacture in town that produces products for a different industry, and both companies decide to work together to build an education program? Perhaps, there is an instructor on staff part time at the manufacturing facility that can teach multiple courses and proctor exams? Why not?

The second major avenue which large manufactures utilize when “growing” their own engineers is by creating Co-op and internship programs. This type of arrangement can prove to be beneficial on multiple fronts. It gives the student a chance to see if they will fit into the organization, while allowing the company to receive the skills and work of the student at a discounted price while they are still learning. If the student spends multiple summers, or even a summer and a semester with a company, both parties will know at the end of their internship if they are a good fit for each other. It also gives the manufacture the opportunity to teach the student their preferred ways of performing certain tasks.

Manufactures need to bear in mind that these positions are not donations of experience to the student, but rather serious endeavors for both parties. Many manufactures will resort to allowing managers to simply assign “grunt” work to engineering students who are interning with their company. This attitude and practice is completely wrong. The manufacture needs to make the most of the opportunity that the internship and/or Co-op program provides. These businesses need to present challenging work with true responsibility upon the shoulders of these students. It is the only way to truly find out what “metal” the student is made of.

Doers’ vs Designers

When building out a technical department, especially from a staff standpoint, managers need to consider what type of “mix” they wish to create in their department based upon the responsibilities assigned to the group. In most engineering, IT, and even Industrial engineering departments, there is usually those individuals who would be considered “Doers” and others who would be ascribed as being “Designers.” These terms are just observations and would certainly not pertain to any title per se, but the premise can assist managers in hiring decisions by illuminating what sort of needs their departments may have.

In technical departments the “doer” is often characterized as someone who is self-motivated, able to solve problems and “work around” the consequences of Murphy’s law. Often, these individuals will exhibit creativity and can work with others from different departments and even outside the company.

The “designer” can often be found working by themselves, they do not prosper in situations where ambiguity is present. They require constraints and definitions as to what is to be accomplished. These individuals are often seen as specialist of some sort. A fully well-rounded technical department should possess both types.

In times past, these “doers” were often promoted to positions of management. Typically, a young engineer who was well rounded and demonstrated business acumen would rise up through the ranks of a manufacturing facility and then finally be promoted to plant manager. There was good reason for these typically career trajectories. It was once believed that if an engineer could demonstrate the ability to source manpower, allocate and manage finances, create schedules, they would be well suited to managing a manufacturing facility. It was common to visit a plant manager in his office and discover an engineering degree on the wall, and sometimes a MBA beside it.

During the 1990s, something changed. As America began to descend into a more litigious society, large manufacturing organizations began to become fearful of litigation. Their fear was no longer concentrated on equipment failure, ROI, or other financial metrics, but rather around employee originated lawsuits. Avoiding lawsuits and employee legal issues became a perceived path to profitability over actual production best practices. Accountants and consultants perceived that enough systems had been implemented in large corporate owned manufacturing facilities that competent engineers occupying plant management positions was really not essential to

continued profitable operations. Given the new legal risks industry was encountering, executives started to promote HR managers and other soft skilled background employees into plant management positions. Now the plant management position in many facilities exists really in name only. These posts are considered to be “positions of development” rather than independent positions held by confident change agents. Plant managers once were responsible for informing their corporations how best to support the needs of their respective manufacturing facilities. Now these positions are places where future corporate leaders can be groomed. That sort of thinking is not entirely wrong, but the problems arise when the development takes priority over the manufacturing responsibilities.

Many gifted engineers and other technically gifted employees find it somewhat difficult to get promoted out of their current roles. There are many reasons for this occurring. See the list below:

“It will be impossible for me to backfill their position. No one has as much knowledge as they do about...”

“They are so much more expensive than someone else that I could place in that new management position.”

“I fear there may be HR issues if they manage others.”

Thoughts such as these often remain spoken only behind closed doors, and in some instances not spoken at all. These thoughts are not really reasons so much as they are excuses. Consider the first reason given where a manager is concerned about backfilling their technical employee’s position. It is ironic that business leaders consider the labor hour of the technical employee to be a commoditized item, yet their immediate managers view their individual talents

as special and difficult to replace. The reality actually resides in the middle of that curve. It is true that each individual brings their own set of talents and ideas to a group, but it is also true that everyone can be replaced. That makes such an excuse too weak to restrain the technical employee from advancing to more influential levels of management.

One of the more common refrains of owners and executives regarding promoting technical employees into advanced management positions is the fact they tend to be more expensive. It is not uncommon in today's manufacturing environment for a technical employee to make thousands more than their operational counterpart on the same organization level. This salary discrepancy exists due to the amount education and demonstrated skill that the technical employee brings with them to their respective position. When promoted to higher management positions, these same technical employees carry these attributes with them to their next assignment. Sure, it may cost a company \$40,000 or \$50,000 extra per year to hire the technical employee for that same management position that an operation employee may be able to fill. It also may appear that by following through with the less expensive option that the company would save a great deal of expense, especially if that same practice was replicated throughout the organization. However, what if the argument was false and the opposite was true? What if by forgoing the more expensive hire, it became more expensive for the business in the long term?

Imagine a situation where downtime and opportunity cost had a huge financial impact on a manufacturing company. One such mistake could cost hundreds of thousands, or perhaps millions of dollars. One might also imagine that a manager with project and scheduling experience (provided by their technical background) might have been able to avoid such a mistake. Wouldn't the increased salary that was required to obtain such a manager be worth the expense. Such a hypothetical illustration is not a rare occurrence. In the manufacturing

environment, critical decisions can have huge consequences. Therefore, the “more expensive” salary option may be the least expensive option after all.

When only the financial statement matter, such ideas are difficult for managers, and sometimes even executives to communicate. Even though there is truth in the mistake avoidance and opportunity cost argument, how does one translate that into actionable steps within their organization. For the manager, owner, or executive that wishes to promote the more expensive employees into management positions, arguments predicated upon hypothetical financial projections alone will not work very well to convince all stakeholders. Such a task requires the use of narratives and case studies. It takes a great deal of salesmanship to sell the luxury car to someone who is convinced they want the cheaper model.

Many times, when the consideration of technical employees arises in regards to management positions, fears of HR issues also arise. There is a stereotype among the technical sort that regards them as less than personable. While this might be true in many respects, the technically gifted understand constraints, rules, and guidelines. Many times, such persons can follow rules with great ease. The other obvious fallacy of such a fear resides in the fact that not every technical employee is a management candidate. Only those who possess the required skills and can properly communicate and corporate with others would usually be considered for such positions. Overall, the HR issue fear is really unfounded.

Chapter 5 – Free “HR” and the Rest Will Follow

Most HR departments are held in chains. On the right hand, HR departments are limited in the way in which they can move due to the number of laws and statutes that they must comply with. On the left hand, they are restricted by self-imposed procedures that originate from a pervasive counter measuring culture.

The United States is known for its opportunities and is considered to be a bastion of liberty and justice. Over the past century, the justice system in this country has accomplished a great deal in regard to codify fair hiring and employment practices. One major responsibility of owning and/or operating a business within any jurisdiction is to ensure compliance with its laws and statutes. The number of laws and requirements placed upon employers by both federal, state, and local jurisdictions has become large, and it has placed a great burden upon the HR departments of many industries. Any randomly selected manufacture in the US on any given day may find their HR department dealing with an EEO complaint, a Title IX issue, or perhaps attempting to understand the impact of a new executive order. There is a strong argument that more employment laws and regulations will be mandated in the future due to the growth of new industries and the increasing size of federal and state government. It is a rare thing for governments to become smaller or to rescind laws.

It may appear manufacturing businesses are so bound by legal statutes there is no ability to operate ones HR department beyond the commonly accepted norms. HR departments are rigid creations which are unable to change due to the amount of legal compliance they are saddled with. Such a statement does not accurately describe the situation HR departments currently face.

HR departments do have a tremendous legal burden that must be attended to, but there is still some freedom left within the hiring and employment domain.

Freedom does have an enemy though, and it is a pervasive religion known as “countermeasure culture.” A great deal of the encumbrance that HR departments face is a direct result of self-imposed regulations to preempt future issues, or to countermeasure past offenses. Such measures are not necessarily a bad thing, but “counter measuring attitudes” can become overly restrictive and monstrous quickly. These attitudes and actions are often exacerbated by paid legal advisors who espouse avoiding even a whisper of legal trouble, no matter the consequences to the company. This philosophy has produced a timid and ineffective hiring environment that has allowed HR departments to become focused on internal department development rather than the wellbeing of their company for whom they work for.

Such an attitude and practice within an HR department is obviously wrong. While not every HR department can be described in such a manner, enough of them can be that it is worth addressing. The crux of the matter really stems from the goals and objectives of the company’s owner and the HR team not fully aligning. Such a situation should not exist. Both owners and HR departments should have the shared goal of acquiring and maintaining the best employees possible, while avoiding and letting go of those that are a “net negative” to the company. That “net negative” term should encompass anything that does not drive the wellbeing of the company forward and should be comprised of more than simply financial metrics.

HR professionals should not have to operate from a place of fear concerning legal action. That is why legal advisors are employed. If a company ever finds their legal counsel fearful of legal action in any way, then the company should promptly find new counsel. Imagine a story from the Fables of Aesop that went like this:

Once there was a heard of sheep within their fence. They were protected from outside predators by two large guard dogs. One day the two guard dogs went up to the sheep and said to them,

“We would like for you to not go anywhere near the fence.”

“Why?” asked the sheep

“Well,” said the guard dogs. “There are predators on the outside of the fence.”

“Obviously, we may be dumb sheep, but even we are aware of our enemies on the other side of the fence. Isn’t that the purposes of the fence? Also, isn’t that why you live here with us, inside the fence?”

“That is correct, but here is the deal. If we actually ever had to fight a predator, we are not sure we could win. We are not confident in our ability. Therefore, because of our fear, we want you to stay in a small area in the middle of the field, far from the fence.”

Replied the guard dogs.

“How are we supposed to do our jobs of eating all the grass contained in this fence. That is vital to our health and wool production. If we do as you requested, we will be cheating the sheepherder!” said the sheep.

The guard dogs replied “Your answer does not matter, do what we say or we won’t defend you at all.”

Sadly, such a fable describes the situation that is currently plaguing many HR departments today. Many large companies have internal teams of attorneys, but those legal minds are often kept busy with possible mergers, government permitting, contract language, etc.

Due to the cost to maintain staff legal counsel, their efforts are often considered too important to be utilized on HR matters. The result of such thinking often leads to outside legal advisors being hired for HR issues when they arise, which further propagates the attitude that facility-based HR should just “fend for themselves.”

There are other components to the problem as well. Many large companies develop a reputation for settling employment disputes out of court. These disputes may include EEO complaints, sexual harassment cases, and even fraudulent workers comp. Once a company has established such a reputation, the “blood in the water” attracts others and the cycle never stops. For this reason, many HR professionals at the manufacturing plant level are often unsure of their corporate legal support. Their uncertainty reinforced by the repeated instruction from their corporate attorneys to “stay out of trouble,” or “be cautious if you proceed,” and “You shouldn’t do that because it MAY lead to....”

Large corporate manufactures need to understand that their manufacturing level HR departments primary mission (to maintain the best collection of workers it can acquire) is often overshadowed by its secondary mission, which has become, staying out of legal trouble. This should not be. Companies of all sizes need to take the required steps to lift burdens off their HR professionals. Local manufacturing HR departments need true and aggressive legal support in contrast to the weak and timid advice that many have become accustomed to. These HR departments need “killer” legal counsel at their disposal. The type of attorneys whose mantra resembles the following;

“We fear no lawsuit. We welcome trial dates. We will appeal every judgement not in our favor until it falls in our favor, or the case can no longer be legally pursued. We never settle out of court! We will keep filing countersuits until we financially break the backs of our opponents!

We aim to crush the spirit of our opposition with our aggressiveness. We will not rest until we have won!”

Smaller manufacturing businesses should follow the same advice. The smaller manufacture will not be able to afford to spend as much on legal affairs as larger companies. However, that does not preclude the smaller manufacturing from firing the timid worthless lawyers that they have kept hired for the past 20 years! Smaller manufactures can still afford to obtain better counsel for their HR departments, and free them to perform their job.

University Degrees

No chapter written about “freeing” HR would be complete without a treatise on the accepted practice of HR departments requiring bachelor’s degree for positions for which one is not necessary. There are two waves of reality that are beginning to collide within the higher education space. The first wave is that the internet has made available the majority of known human knowledge to a great number of people. The other wave is the fact institutions of higher education are failing to provide an education which is worth the price to obtain it. The value proposition is simply not there anymore in most instances. What is the purpose of university? Are universities meeting expectations? What worth is a university degree? The days in which high school guidance counselors can persuade every senior that they “must attend college, or they might die” are coming to an end.

As I write this book, my wife is pregnant with my son, and I have another son who is nearly four years old (1/5th of experienced life for a 20-year-old man.) These facts have caused me to ponder education in a manner which I never have before. Being an adult who has worked for many years in the industrial workforce, I have started to understand the true motives behind

many of the espoused “truths” that were proclaimed in my ear as a young man. There was a great deal of marketing, salesmanship, culture, influence, which had to combine to convince me to enroll into engineering college. Even more marketing and sales was required to persuade me to enroll into an MBA program. Who benefited more from my attendance, the universities, myself, both?

There are many parents like my wife and I, who have delved headfirst into all the current educational offerings for young people. I suspect that many who have ventured down that same path as us, has walked away just as disappointed as we are with the current state of education. For anyone who has studied classical education practices or has spent time reading books authored by minds from two centuries ago and before, it becomes evident that the thought processes of men educated in the historic classical manner are different from the modern man. Every time I read Algernon Sidney or Francis Bacon, I become aware of the shortcomings of my education.

The purpose of education should be to prepare graduates in four different areas. First, gainful employment within the time and environment in which they live. Second, a trained and disciplined mind that is adept to learning and mastering new subjects quickly. Third, an understanding of history (human nature) as it relates to events and outcomes. Lastly, the ability to structure and evaluate positions and arguments. Any young person that can earn a degree and graduate with all four of those objectives accomplished has truly been educated. Sadly, most universities do not provide an education that is comprised of all four attributes. Most universities over charge (federal student loans helps create that opportunity) and underdeliver.

Education has become nothing more than a stamp of accreditation. In most cases, employers are simply relying upon the university system to pre-screen candidates. The unspoken dialogue that exists is similar to this;

“Look, Jim graduated from that university with a MBA, he must be qualified. By only hiring from a pool of people that graduate with a master’s degrees, we are taking most of our risk off the table. They accomplished something (obtaining their degree) surely, they can perform the work we will assign.”

Hiring college graduates is done not because the graduates are truly educated and bring great skills and knowledge with them, but because it is perceived to be less risky. It is the lazy way out for many employers.

The opportunities for online learning are increasing daily. Since the opportunities for an online education keep increasing, and the value proposition of the university system keeps declining, it starts becoming clear that there is a large possibility that the days of traditional degree programs from colleges might be numbered. Since the only purpose currently for a college is to be a body that examines and certifies an individual’s knowledge about a certain subject matter, their privileged position is eventually going to be challenged.

Once individuals discover a way to demonstrate their competence in various subjects through alternate forms of accreditation that are widely accepted, the current university model will forever change. Employers’ acceptance of these alternate forms of accreditation will have the greatest impact on the demand side of the equation. These accreditation alternatives are already being developed, and once a few of them finally “catch on” the labor pool will drastically change. Demonstrating one’s education will become accessible and affordable to as

many people as have access to the internet. The time required to acquire the needed skills will be reduced. The world will operate differently. The current university system will have an important decision to make, hold on to their past, or transform themselves into this new style of institutions. I suspect the university will remain due to research and sports, but number of undergraduate degree programs will be greatly diminished. This will become Netflix streaming vs Blockbuster video rental.

Considering these probable changes, what actions should employers take now and in the future? If there is little utility in the university degree, why not start accepting alternate forms of accreditation that would demonstrate competency in a subject matter as well or better than the average college degree? The business leader should accept an entire range of certifications that would demonstrate that a job candidate has demonstrated the required competency in the specific field of study. A few examples of such certifications might include certificates of completion for privately sold sales courses, or perhaps technical certifications provided by IBM, Google, etc. An employer may even accept a white paper demonstrating a case study involving efficiency improvements within a similar industry. How about apprenticeship letters of recommendations from other business owners in your community? That sort of practice used to be very common! What would a business owner trust more, a college degree or a letter of recommendation from another business owner whom he has known for 23 years?

The sort of accreditation that is acceptable will largely depend on the position that HR is attempting to fill, but that is okay. As The HR department starts to become more comfortable with this concept, they need to develop a list of approved training, certification, and accreditation alternatives to the standard degree that can be openly advertised on their HR webpage. That will allow a wider range of perspective candidates to know what education is required for

employment with a particular employer. With such practices in place, it would be possible to receive young, hungry 18-year-olds who have completed courses via the internet parallel with their high school degree. These young employees will be less expensive and perhaps hungrier for overtime, which would be advantages for the manufacturing company.

Women in the Workplace

Women and men are different. Despite what your views are, despite what the past 150 years and multiple waves of feminism has expressed, women and men are different. The brains of men and women are different physically, starting in the womb. This is not opinion, but fact that has been published in studies. If the brain structure evidence was not enough to persuade, there is the other obvious fact that women have wombs.

These are facts, realities, like gravity. To ignore these facts is to harm both men and women. A man and a woman working together can raise a family, build a home, run a family business or a farm. They can accomplish more together than they can separately. Our current society is obsessed with trying to make women like and “equal” to men. Women and men are not equal, they are complementary. Make no mistake, feminism hates women to the point that they no longer want them to be women but would rather they be men.

Recently there was a post on LinkedIn that was espousing the need for equality for women. As one of its arguments it stated something very similar to the following:

“Cities have been designed around the male worker, neglecting considerations such as safety, accessibility, and convenience for women. Workplaces have also been built around the male worker, creating gender wage gaps and impacting career advancement (and cold offices!)”

What ludicrousness! If women need to be treated with “equality” to men as this author claimed, then why should cities need to make accommodations for women? Furthermore, I can find many factory floors and powerhouses with no air conditioning where men and women are welcome to perspire equally in addition to receiving equal pay for the same job.

There has been a common cry for decades which claims that women do not receive equal pay when compared to men. That premise is false. Any deficits that exist in average pay of men and women is a direct result of the type of work that women and men chose to involve themselves in. Very few women enter the trades. They are welcome to do so! One sees few women covered in grease climbing inside gearboxes performing inspections: it pays well! Go to any engineering department, few women are there. That is not because women are not given opportunity to go to engineering school. There are many incentives and scholarships to boast the enrollment numbers of women in STEM fields. The reason for this low enrollment of females in the STEM fields is that women are geared more toward relationships, whereas the testosterone in men gears them towards “things” and competition. These attributes of the sexes influence the type of work that they pursue, and that is okay!

There is one large difference that is most crucial between men and women in the workplace. It is not always obvious but it is the most impactful on employed women and their employers. There is a large difference between the amounts of agreeableness and disagreeableness that is present within the two sexes. Women tend to have a more agreeable nature whereas men tend to exhibit a more disagreeable nature. These statements are generalizations but that does not make them any less useful or impactful. If a manager request that a male employee perform a task which is completely stupid and may end up harming the company, that sort of request will usually be met with some strong and intense language. In

contrast, if the same sort of situation were to occur to a female employee, the pushback will usually be less explosive.

In addition to the level of agreeableness female employees possess, many women feel inferior to their male counterparts in the workplace. This is because men and women are not equal in physical strength, drive, and constitution. Many women feel it necessary to compete and prove themselves to be just a “tough as the men.” This attitude hurts the female employee greatly. If one was to pull some random 53-year-old man off the street and inform him that he must work for 85 hours a week for the next year, he would be able to do it and get through the year okay despite being tired and burnt out. If one was to try to task a woman of the same age with such a challenge, the number of problems she would encounter would be much higher. The problem does not lie in the reality of that truth, the problem lies in ignoring it and pretending it is not there. Managers must recognize these tendencies in their female employees and look out for signs of struggle because women do not speak up as often when they are suffering in their workload; Therefore, the manager remains unaware that the workload may be waxing difficult for the female employee. If most employers ever stopped to analyze all the cries for “equality” they would recognize that they are nothing more than disguised cries for accommodation. Accommodation can not occur without defining what the situation truly is, even if it is political incorrect.

Second Helping

During the layoffs that occurred during the GFC (2006-2009), many employers found themselves asking remaining employees do accomplish additional tasks. It became a common practice that upon the exit of an employee or a manager the essential duties of that missing employee got spread around to the remaining team and in some instances, dumped upon one

person. The practice became so common that it still occurs today. No matter what the industry, all businesses will eventually find themselves in the position of having to reallocate tasks due to an exiting employee.

When it is necessary to have good employees do extra work, they should be compensated fairly. There are many instances where existing employees are asked to take on the duties of two jobs but are not offered anymore in salary. These practices must stop. Consider this small story.

Bob has decided to leave the company. Bob cares about his fellow employees and has enjoyed an excellent relationship with his employer, so he gives the company an advanced notice of 6 weeks. Bob was simply offered a greater opportunity somewhere else. The employer thanks Bob for the advanced notice and decides they have time to fill the position...but do not place hiring as a priority. Seven weeks later Bob is gone, and a manager wakes up somewhere out of his stupor and exclaims “Where is Bob?”

Bill replies “Bob is gone!”

Then the manager exclaims “Bill, get in my office now!”

Then the manager begins to present to Bill that he will be taking over all of Bob’s responsibilities. When Bill asks about getting paid more money, he is laughed at.

Such a tale is a little over the top, but that story occurs often, especially in today’s business environment. These additional tasks which are bestowed on the hardest working employees are often given without the required authority to accomplish the tasks in a timely manner. Authority follows responsibility and it is customary that pay follows both of those concepts. When an employee is given greater responsibility without the corresponding authority which accompanies it is, then the natural order becomes disrupted. These actions can quickly

destroy the moral of a team. All the other employees are aware of the injustice which is placed upon the hardest working mule in the barn. This causes them to withdrawal and put their heads down in hopes of not being noticed. What is the answer to this? Consider the previous conversation between Bill and his boss going differently. Here is an example.

“Bill! As you know Bob is gone. You also know that he gave the company 6 weeks notice before he left, which we turned around and utilized poorly. Now I know that your plate is already full, but you are the one I naturally thought of. We need somebody to take on Bob’s old responsibilities. Now I know this is a lot to ask, but I am going to give you a 20% pay bump while this is going on, until we can find someone. Here is our reasoning for the 20% bump. We don’t expect that you are going to be able to do your job to same degree, or Bob’s job to same degree of quality which we are accustomed, but we also think it is unfair to ask you to take on all of this responsibility without giving you some of Bob’s old salary. You have seen that done before, and it isn’t right. So Bill, what do you think?”

What will Bill think of such an offer? For starters, it certainly appears more attractive than simply giving him extra work and telling him to like it. Bill may even wish to counter by saying “If you give me 50% more, you won’t need to hire anyone else!”

Carrots

Non-salary-based incentives seem to be on the rise. Job boards are full of language describing salaries as “competitive” while taking large amounts of space to list the multitude of benefits available to a perspective employee. While there may be utility in some of those offerings, the never-ending addition of extra benefits does not keep making the position more attractive. At some point, offering one more plan for pet insurance will not persuade a great

candidate to take the leap. Most employees, especially with families, are incentivized by two goals, time and money. Employees with mouths to feed don't need yoga hour, they need grocery money.

The employer's objective is to obviously add incentives that are financially responsible for the company. During the COVID-19 crisis, there were many businesses who experimented with the work from home concept. Some businesses found success with the remote work setup, but that obviously does not work well in a manufacturing environment. Almost everyone needs to be on site in order for a manufacturing facility to operate correctly.

Since remote work situations are not feasible, alternative time related incentives may be considered. One of those ideas is flexible work hours for certain employees within the manufacturing environment. Consider the following as an example of what is possible.

Most flexible schedules will only be able to be offered to staff. One idea would be for those staff employees with young children under the age of 16 years of age (driving age), to be able to observe flexible start and end times, so long as those arrangements are worked out with their manager. For those with young families. Such an offering could very well influence an employee's decision to stay with the company that offered such an incentive.

Years ago, before the retirement of the baby boomer generation shifted up into high gear, there were all sorts of plans in place for legacy knowledge transfer. These plans were rarely enacted, but their reasoning was sound. The objective was to have those who are about to retire to spend extra time with younger employees and share some of their knowledge. Once the older generation walked out the door, the company would not have to experience such a knowledge

gap. Anyone involved in manufacturing today can attest to the fact that there is most defiantly a knowledge gap. The programs were good, just very few manufactures acted upon them correctly.

Additional pay may incentivize individuals to be involved in fulfilling the objectives of such a legacy knowledge program. A manufacture may wish to offer unlimited overtime to employees over 50. These employees could use that extra money for catch up contributions toward their retirement savings, and it would offer a chance for the company to obtain and record their knowledge before their retirement. If structured correctly, that could really be a great program.

Non-Merit Based Systems

Many HR departments are more reminiscent of alphabet soup than actual personnel departments. There are loud voices in every direction proclaiming the arrival of DEI, ESG, XYZ, etc. All these ideas will prove to be failures. Why? Because so long as there is true competition for resources on this planet, reality will win in the end. DEI and ESG both are an attack on the merit-based systems. Yet the false realities cannot replace actual reality. Merit based systems will always win. Gravity is not just a patriarchal constrict given to us by the oppressors. Gravity is real and it will cast its opponents to the earth.

The manufacturing floor is not the place for social experiments. No business owner or company should ever be forced via law or social shame to stray from merit-based hiring and promotion practices. I remember once reading a 10-K of a company where the author claimed that their hiring practices are predicated upon merit, and their first goal in filling a position is to always promote from within. This was the only 10-K that I read the entire year that didn't have a complete paragraph or page about DEI hiring practices and activity. I suspect that the only

reason that company was able publish such a statement was because the original founder of the company still owned 60% of the company's shares. There was another story that I recall hearing concerning a very successful CEO of a multi-state engineering firm that employed hundreds of people. It was once reported that he expressed his frustrations concerning the alphabet soup movement. There were policies that his employees and himself wished to implement but he had about three employees who were always complaining and causing problems. They were obsessed with the latest in vogue oppression sweeping the nation.

Owners, executives, and managers need to be reminded that it is perfectly acceptable to fire people. If there are individuals that are constantly cultivating strife within an organization, they need to be removed. (Proverbs warns about the man that stirs up strife 14 times!) Many employers fear the lawsuits that follow when they should fear having lost control of their organization. Most of the time, the lawsuit would be worth getting rid of the headache.

Demotion

Promotion is very common and the idea is well understood, even if the execution is sometimes poor. The promotion of an existing employee should always occur when two sets of circumstances align. The first situation which must develop is that an employer needs a position to be filled by an individual who is able to wield a certain level of authority, shoulder the corresponding amount of responsibility and possess the required amount of competence to succeed at the role. The second circumstance which must exist is an employee within the organization that matches the description and is willing to take the position.

As simple as that concept is, many organizations fail to wait for those situations to occur organically. Managers allow emotions to dictate promotion decisions. This can often be

witnessed when there is an employee whom the company does not wish to lose or has become a favorite. These employees are obviously “ready for further development.” A position is created for them. There is another well-known concept of “Up and out of the way” promotion. This type of activity can be witnessed when those employees who are well liked continually fail at every position in which they are placed. They simply keep getting moved up until their failure can no longer cause problems. That sort of practice is common in large organizations where there are plenty of overhead positions where incompetence can successfully be hidden.

Those are examples of poor promotion practices. However, there is a unique situation that is borne out of honest effort which can still turn sour. Sometimes an employee is promoted to a new position for all the right reasons, but something goes wrong. Despite everyone agreeing that the promotion was a good idea, the reality of the employee in that new role is not working out. The stress load is too much for the employee, or the soft skills are not blooming properly. Whatever the reason, it becomes evident that the employee is struggling in that new role. The most common response is of business leaders is to give them a little training course, and a slap on the back all the while encouraging the employee to “hang in there.” Well, they are not “hanging in there.” They are flopping around on the bank like a dying catfish.

For those that have ever stopped to consider, this idea describes how many leadership positions are filled in corporate America. A person is promoted until they reach a position to which they are unable to become distinguished and then they are left there. This means that many leadership positions are filled by people who are not great at their job. This type of promotion practice needs to change. If valued employees who have been promoted are allowed to remain in leadership positions in which they are struggling for long enough, they will find

their own way out and leave the company. It is truly in the company's best interest to offer alternatives for struggling employees in newly promoted positions.

When this situation occurs, the first step should be advanced training. This training should not be limited to what is available in the corporate training library but should be allowed to be any training that the employee and their manager agrees upon, no matter the provider or cost. Once that course of action has been exhausted, or agreed to be the improper solution, if there is still no satisfactory improvement, the employee should be offered the chance to move to another position, including the position that they previously had with the company. Struggling employees need a way to exit positions to which they are not properly suited without the fear of job loss. Most companies could be convinced to proceed with the training idea tomorrow, but allowing a newly promoted employee to step back, would cause embarrassment for the company and employee. That is why it is such a rare occurrence, despite it being the correct thing to do.

For companies to allow for newly promoted employees to backtrack, they must overcome the embarrassment aspect of the retracement. This can be accomplished through clever means. For example, it could become a policy that every promotion is on a trial basis for three months. For those employees who try the new role, and decide it is not for them, they receive the salary amount of the promoted position for an entire year anyway. Therefore, it is no risk to the employee to try, and it encourages more employees to apply. There may be other ways to reduce the fear of embarrassment. There needs to be incentives to try, and incentives to retreat if the position does not work out. If more companies would consider such ideas, there would be better staffed organizational charts. This type of activity takes the sting out of demotion, and no longer makes it taboo.

Unions

Union labor in the manufacturing environment can usually exist in one of two extremes. There are certain unions, largely trade specialty or trade specific unions, who perform a great service for the tradesmen whom they represent and are usually a pleasure to work with. Their rules are simple and well defined. Such unions are focused on advancing their trade and the wellbeing of their members. Often, these unions are heavily focused on skills training, apprenticeships, and member benefits.

For those manufactures who have experienced such interactions, continued relationship with those types of unions can be addressed simply. Manufactures should strengthen their relationship with these organizations, especially on areas of common ground. These areas would include education and training in addition to trade organization outreach. Strong relationships between these trade unions and businesses may even prove beneficial when petitioning regulators concerning unfavorable proposed rules and statutes. When business and unions oppose regulators together, the gravity of their views becomes heavier and can often bring about change. For the business that is fortunate enough to be blessed with a good union local, building a strong relationship can prove to be very beneficial for both parties.

There is another type of union. One that does not represent the skilled tradesman, but rather an unskilled worker. These unions are often focused on revenue for their own organization more than the wellbeing of their members. Sometimes, these locals can become obstinate, problematic, and at times downright adversarial in nature. These are the type of union relationships and interactions that need to be considered carefully and addressed appropriately.

Such a culture within a union workforce might flourish due to any number of reasons. Sometimes, these tensions can be left over from an event that occurred decades ago. There are other times where a local union president can stir up strife in an attempt to maintain his position.

Poor union workforce attitudes might be spurred on by poor leadership decisions that have been made by frontline supervisors. Whatever the reason, if the problem is not correctly addressed, the results can become devastating to the business. A house divided cannot stand, yet I have seen union employees purposeful sabotage company equipment. I have also bore witness to young frontline supervisors fanning the flames of tensions all because a union employee “smarted off.” It turns out that young supervisor looks a great deal like the man in the mirror. These types of actions are illogical. If a manufacturing facility shuts down due to workforce tensions, then everyone losses. Sadly, such poor work environments are more common than anyone would care to admit.

One wrong way of addressing such workforce tensions between a union and a company is to do nothing. Disease does not just get better when left alone. Such workforce environments will not improve without intervention. Another common approach is that of appeasement and dealing with the problematic union with a weak hand. Such dealings accomplish little other than to promote more and more concessions, which in turn sets unfavorable precedent for future grievances. The result of that cycle ends with the employees managing the company in illegitimate ways. Muck like a toddler who rules its parents. Manufacturing sites that suffer from such cycles of appeasement are unable to stay profitable over a long-time horizon. There have been many manufacturing facilities when entering their contract negotiations with union labor, would consistently give up concession after concession. This capitulation continued until the manufacturing facility leadership painted themselves into a corner and was unable move as freely as they once had. When the economy started to suffer, the manufacturing leadership was no longer able to take the required steps to see themselves through a lower sales environment.

There is another approach which involves the heavy hand. It is debatable as to whether such an approach is correct, but it is certainly worth evaluating. It can best be demonstrated through a story.

When I was a young man working in my first industrial engineering position, there was a facility next to the location that I was employed at. This gave me some insight into all that transpired. The story unfolds in the state of Illinois on the Ohio River. The facility where this story occurred was owned by an international conglomerate. The major product produced at this facility was HF (hexafluoride) which was used in another neighboring location for uranium enrichment. Due to the critical nature of the process and the national security risk that it presented, the central building at the facility was under the jurisdiction of the federal nuclear regulatory commission. This facility was not making toys.

For many years, this company had experienced poor relations with their local union workforce. These tensions had resulted in poor production in addition to strained communications. When the time for contract negotiations arrived, the local union had a plan to bargain for a large increase in health benefits along with a raise in pay. However, the company had been waiting, and it had other plans. Because the owner was an international corporation, the company could afford to not have the facility function, and still not experience any significant impact on their revenue. During the contract negotiations, the company locked out the union.

It was a shocking move to the community, and a real shock for the workers. The facility was not operational for about three weeks. Staff employees were still on site, but no workforce was present, therefore production of their product came to a complete halt. The local news outlets came to report on the story. The union employees had assembled a large and festive picket line, complete with multiple 10 x10 tents, lawn chairs, charcoal grills, flags, and a giant 25

tall inflatable rat! Across the road from the picket line was an empty grass field, where all of the picketers parked their vehicles. This was the side of the road which told the story. There were a host of brand-new vehicles, with accessories. Brand new expensive trucks with lift kits and wheels, some pulling boats. This signaled to me one thing and I suspect company leadership took notice as well. "These employees have payments, and they will break."

As the weeks went by there seemed to be no yielding by either side at the negotiation table. Without warning the company made the decision to bring in a contracted nonunion workforce to bring production back online. To get the workers safely across the picket line the company would send chartered buses across the river to Kentucky to pick up the workers in an undisclosed parking lot and shuttle them to the facility. Within six weeks of making that decision the nonunion workers were breaking production records. There was still no compromise.

The months continued to pass. Trees started to change color due to the onset of autumn. The shorter days and cooler weather affected the number of attendees at the picket line. Once where 50 to 60 employees stood and waved in a lively manner, now there were only 5 or 6 individuals, trying to stay warm with their winter attire. All hope was not lost, they were still carefully guarded by their giant inflatable rat.

Behind the scenes and unreported in the media, conversations started to occur between the local union and its national representation. The savings and cash reserves that the local union had acquired through its dues were becoming exhausted. The lockout was causing great expenses, and the picket line protest was expensive to produce.

The local union went broke financially. Once that occurred, the local union representation asked the national union for funding to help them get through the remainder of the lockout. They

had agreed to assist in the negotiations, but they were unwilling to aid the local in any financial matters. I remember my father telling me how his local union (which was part of the same national union, but at a different location) was requesting donations of its members to assist the cause of the lockout which was occurring.

As time continued to march on, the company's position kept getting stronger. Six months into the lockout, the local union was financially broke, and the company was still producing product setting new production records. Since the company was in such a good position, they were in no hurry to settle the matter. The lockout would continue for another seven months before finally being resolved and a contract agreement was settled upon. The union workers were able to achieve a slight raise, barely enough to keep up with inflation, but the augmented health coverage that the union was for hoping proved to allude them.

Who won? That depends on who you ask. Perhaps the local union won because they held out and fought as a united front against one of the most powerful corporations in the world. Perhaps the company won, because they were able to prove who the boss truly was, receive a labor contract they were accepting of, and never missed revenue due to their continued production. Maybe a bunch of families lost, since they were without that income for 13 months, hardly making that small raise worth the fight. Such a conclusion requires wisdom and judgement beyond what I am capable of.

It is certain that the company secured an important outcome out of the entire ordeal. Control. If they had problems before with their local union organization thinking they "ran the show," that attitude was squashed; However, it was quelled at a high cost. Those workers, their families, and that entire town will never forget what happened. That type of memory often produces new attitudes, the kind that never goes away.

It appears that when dealing with difficult workforces, the light approach is not correct, and the heavy-handed method produces unavoidable consequences. This conclusion leaves many manufacturers in the difficult position of attempting to figure out what the correct course of action is when dealing with problematic union workforces. Below is a little advice for those that find themselves in such a situation.

As with any matter involving relationships, the only party that one has complete control over is themselves. There is the common adage that states “If I fix me, then 50% of the problem is solved.” As cliché as that saying sounds, there is a great deal of wisdom in it. When attempting to fix relationship problems (and that is what a company and union conflict is at its core) one must first address themselves. Circumstances may prove unchangeable, the other party may prove unreachable, but there is always one variable which can be transformed the moment one decides to do so.

Owners and executives wishing to change their company’s relationship with their union workforces should first determine where the greatest amount of contact occurs between the union workers and the company. That point of interaction is often the company’s front line supervisors. A subject upon which an entire book could be written. The front-line supervisor is often one of the most stressful and difficult positions to occupy within a company. Consider the following:

1. The front-line supervisor must make numerous decisions each shift under constant dynamic scenarios.
2. The front-line supervisor must pass along the communications from the company’s support departments to his workers.

3. The front-line supervisor must become middleman between his workers and all of the company's support departments. (Different direction of communication)
4. The front-line supervisor is often tasked with any new reporting which is developed by management.
5. The front-line supervisor often has little input in the workers he is given, or the tools which he is given.

The front-line supervisor position is a serious one. The character and attitude of a company's front-line supervisor is a determining factor in the attitude and relationship that exists between the company and its union workforce. If a company wishes to improve relations between itself and its union employees, the attitude of the front-line supervisors must be correct.

There are truly on two ways that a company can impact the quality of a front-line supervisor. Companies must hire the correct people to become frontline supervisors and they must train them properly. Such focus and attention toward the frontline supervisor position is rare. Many frontline supervisors are simply the best worker on a shift who takes a natural leadership posture, and over time is asked if they would like to assume the position. Often such an action would require them to leave the Union and join the company as staff. If tensions are high between the company and the labor force, this newly promoted supervisor can often be viewed as a traitor: this hinders their ability to lead. To compound the problem, companies will often send new supervisors to some politically correct, socially acceptable, psychologically driven, leadership class for a week. Which does nothing but offer useless advice and compounds confusion as to how to handle the supervisor's new responsibilities.

Determining how a company expects its frontline supervisors to interact with a workforce is not an activity that can successfully be contracted to a third party. That determination must be made by the company's owners, executives, and managers. When an organization or company finds themselves in a position where the labor force is difficult to work with, it is up to the leadership to identify and document how they expect their frontline supervisors to behave considering the situation at hand. See the following example of some simple rules that a company may develop for its frontline supervisors:

1. Do be professional at all times.
2. Be firm, but kind in speech.
3. Do not show favorites.
4. Train and teach where required.
5. Offer support in areas of manpower, materials, time.
6. Plan ahead, and have backup plans.
7. Focus on the shift and not the reports.
8. Work by the contract book without exceptions.
9. Etc.

Such expectations need to be shared with the frontline supervisors before they ever take the job. These supervisors should be judged against whatever rules are created. Never just keep adding to the list of rules. No more than ten rules.

There is a common abuse that needs to be addressed in regard to frontline supervisors. This abuse affects their ability to perform their primary responsibilities. For those companies that are wishing for their supervisors to be more engaged with their workforce, they must free their supervisors from their computers and all their unnecessary reports. Frontline supervisors are not managers, they are not industrial engineers, they are not accountants, they are not HR, they are safety. Companies must Stop. Companies must stop treating their frontline supervisors as extensions of every department. These positions are there to direct shift work, not act as administrative assistants to every department in the company. Pouring every new report and countermeasure on top of the heads of frontline supervisors is a sure fire way to cause problems for an organization.

Manufacturing companies who are wanting to see changes in their supervisors and their labor force, must start to change themselves. These companies must relieve frontline supervisors of their reporting burden. How can the company reduce the reporting burden of the frontline supervisor? If a company takes the position that more reporting is better, than they truly do not trust their supervisors to perform their jobs correctly. In such cases, the supervisors should be fired.

Other departments should be present on odd shifts if they wish to implement changes. If HR wishes to introduce a new policy, then they need to communicate said policy themselves to each shift. This will require support departments to be present on nights and weekends. Should an engineer reasonably expect a frontline supervisor to do engineering work for him on night shift? It is just as ridiculous when, accounting, HR, and safety expects the frontline supervisor to perform duties for them on odd shifts as well. Managers need to start making it clear that if changes are to be communicated by support departments, it is not the supervisor's job to do that.

There needs to be a great deal more responses to these support departments that sound like the following: “Suck it up cupcake! That is not the supervisor’s job, that is your job, so you will be the one coming in to perform it!”

For the manufacture who manages to implement such changes, they will have placed themselves in a better position. They will have given the frontline supervisors the expectations of how they are to interact with the employees. They will have freed up the supervisors from the heavy administrative burden, which will allow them to lead from the floor and not an office. Over time, such changes will bear fruit, but one must be diligent to not allow the company to slip back into old habits. If this can be accomplished, the labor force will start to understand they are a priority: production is being treated as a priority and the company is making an effort to pay attention and demonstrate leadership. Actions change the dynamics of relationships.

There are other actions which a company can take when dealing with a difficult union labor force. Companies must be resolute in the way they deal with their union workforce. Every manufacture must understand when utilizing union labor, they are dealing with a contract. Contracts impose special conditions and considerations when would not otherwise be there. This is true on the surface (where the contract spells out special conditions and rules) and below the surface (where the contract acts as an instrument of division in the natural relationship.) Some people will be afraid to violate the contract and will be more conservative than required. Others will study it intensely to figure out how to game it. In the absence of a contract, these activities do not occur as often. Management must take a hard and just line on the contract provisions in every area. No half measures or allowing anything to slide. Every hill must be a hill to “die on.”

It must be understood by all management that every effort shall be taken to adhere to the letter of the contract and in the absences of clarity, to the spirit of the contract. If any disputes

arise on how to interpret the contract, then each dispute must be taken fully to arbitration to receive clarification. There is a way to accomplish such actions without flaming tensions and it needs to be made clear to management that remaining clam and keeping tempers cool is the goal. Many manufactures become “spongy” in how they deal with contract issues. Such weakness is what usually leads to more problems. Manufacturing is not “I’m okay, you’re okay.” Rather it is a difficult business which requires resolute and decisive action.

Owners and leadership should always strive to accomplish their goals through peaceful means where possible. The proceeding suggestion of working with frontline supervisor to change the dynamics of the company/union relationship and becoming resolute in how the company deals with contract issues are two ways of accomplishing better relations. One aspect of these proceeding methods is that the business has nothing to lose by trying, there is only the risk of improvement. If a company finds themselves unable to improve the work environment after having given these methods reasonable time, then other courses of action may be required.

This next approach would only be recommended in the worst of circumstances, after all other previous methods had been exhausted. Whereas there was no risk of negative consequences with the previously mentioned actions, the following method could produce worst tensions in the future, especially if the attempt fails. This concept could be referred to as “breaking the will,” and it would be just one step shy of a complete lockout.

Companies that find in necessary to attempt such an endeavor will need all managers to have a complete knowledge of the contract. Great labor attorneys will also be required. The approach is simple, but only works if the cost of arbitration is shared by both parties. In such a scenario, every grievance would be fought all the way to arbitration. The goal is to create a financial hardship on the local union hall by simply outspending them. By fighting grievances

that are clearly spelled out in the contract, new precedent will not be set. This approach will not work with a weak mediator, or weak representation. If the company representation starts making concessions by agreeing to countermeasures meant to dissuade reoccurrence of the grievances, the entire process fails. This approach is difficult to execute and should only be attempted in the direst of circumstances.

Throughout all the previously mentioned approaches, front line supervisors knowing the labor contract is essential. If manufactures do nothing else other than ensuring that their front-line supervisors know their respective labor contract, then great strides will still be made.

Chapter 6 – Technology

How should leadership in manufacturing frame their perspective towards technology?

Many proclaim early adaption of the latest trends is an essential mindset in order to sustain a competitive edge. Others might tout careful adaption of only proven technologies, let the “other guy be the guinea pig.” As of late, many followers of the AI revolution and graphene seem to be yelling in the public square megaphone their technologies will change the world! Who is correct?

Most businesses suffer from efficiency loss due to difficult or repetitive tasks. These businesses also suffer from a constant barrage of sales pitches and advertisements espousing the latest technology which will eliminate their efficiency issues. Most of these technology sellers start by promising the world and end by delivering a map. There has been many a business owner who faithful marries their business to a new technology only to find themselves wishing they had never done so. Consider some common thoughts of business leaders towards new technology adoption.

“Everyone in this industry uses this technology now. I guess it is our turn.”

“The salesman said it can do all these things, and it is expandable!” (Run for your life!)

“Well, it really does not fit our business, but it is close, so I guess it will work.”

“All the young employees are saying we need this, so maybe they are right?”

“This really seems too big for us, but I guess we can grow into it.”

“I wish there was a program that would just do “XYZ”, but it would be too expensive to have made.”

One would be wise to notice one common thread in all those statements. There would appear to be an attitude of “settling” in each of them. Many times when a business acquires a new technology, there are no adverse consequences. Yet, there are other times where “canned” systems simply don’t fit a certain business, and the business ends up being harmed by attempting to make the technology fit.

Most of the examples and descriptions used here will allude to technology that is strictly software centered; However, in the manufacturing environment, that is not always the case. Technology solutions may include software, electrical, and mechanical apparatuses all integrated together. The manufacture business leader should feel free to apply these principles to anything their business considers technology.

In most instances, when a business is evaluating an off the shelf technology (even if it offers some customization) the business leaders must accept that their employees will end up structuring their business practices around the new technology. This aspect of technology adoption must be considered when evaluating any new technology. Another common mistake which is made comes in the financial justification for technology purchases. When acquiring a new technology, many businesses will end up not utilizing all its features. By choosing to not use all aspects of the technology, many business owners render their ROI calculations mute since the return calculations are based upon full utilization.

Consider the business owner who has been operating his receiving department off spreadsheets and his accounting department off a popular accounting software package. If this owner was to purchase a full ERP system, will he really utilize all its features?

Other considerations business owners should be aware of when choosing technologies for their business are the long-term consequences of adoption. For those business owners who chose one vendor's offerings over another, they may find it difficult to switch to another vendor's product in future due to having become dependent upon the original technology purchased. Many technology providers create an "eco-system" around their products and services which will necessitate more purchases from their product line. Furthermore, training employees on a completely new system may prove to be time consuming and frustrating to all parties involved. When evaluating technology purchase decisions, business leaders need to decide if they need expanded functionality in the future and use that information to influence their purchase decision.

The technology space is a fast-changing landscape. Before purchasing technology solutions, business leaders need to consider from whom they are purchasing their products. Vendor evaluations should be complete and well thought out. Questions such as "How long has the company been in business?" should be asked and answered. There have been many instances of a software company being purchased by some larger organization. Sometimes products that were sold and serviced by the software company which was acquired become "no longer supported." These types of situations occur often and manufacturing leadership must consider such risk before adopting new technology, no matter how good it appears.

Custom Solutions

When business leaders hear of custom solutions, they immediately think of large capital outlays or cost prohibitive proposals. This prejudice causes many to not even bother considering such solutions. That would be a mistake. Given the correct circumstances, a custom solution (even if it is initially expensive to build) may be better than an alternative that only somewhat meets the needs of the business.

Consider the following example. A local manufacture finds itself in need of a workorder system for the business to track its maintenance activity. In this example, the cost of the perfect custom software solution is \$250,000.00. This system would represent the pinnacle of all workorder systems this manufacture could purchase.

This manufacture has ten maintenance employees who would be utilizing the new work order system. Each maintenance employee on average cost the company \$75.00 per hour. By purchasing the canned off the shelf system, these maintenance employees are having to spend an extra ten minutes each day which they would not have to spend if the business had purchased the custom solution. That math equates to \$12.50 a day per employee, multiplied by 10 employees (\$125.00), multiplied by 252 days per year (\$31,500). Over the course of five years, the canned shelf system cost the business \$157,500 just in extra maintenance labor. That does not factor in the ten minutes of downtime on the operational equipment. If one was to contrast the custom solution to a canned off the shelf solution, one may find something interesting. The custom solution may be less expensive despite its initial cost.

There are some other strong arguments to be made for purchasing a custom solution. One of those arguments is that a custom solution can grow with an organization as it expands and its needs change. Moreover, the way in which the business expands and changes is not determined by its technology. It allows freedom in the way the company conducts its business. A canned

solution may “hem in” a business. In most instances a custom solution will not be as costly to expand or upgrade once the base is already created. Furthermore, ongoing support for the technology can be appropriated as the manufacturing business deems fit, and not the solution provider. A manufacture may wish to place a retainer with the custom solution provider for future support or hire full time staff to oversee the technology and work on expansion projects.

Determine Solution Requirements

It is a common occurrence for management to shop for technology-based solutions without knowing what their needs truly are. That sort of behavior usually ends up with others having to suffer for management’s mistakes. If business leaders spent more time with their employees and management determining what their needs were, rather than getting pitched to by salespeople over lunches, then they would be better equipped to make proper purchasing decisions. How does management determine what their needs are?

A long-held tenant of project management is determining scope. That is exactly what business leaders should do before shopping for technology solutions. Business leaders should never assume because they once performed a task that they know how it is performed today. Meeting with employees and supervisors, discovering pain points, those are the type of activities which will prove enlightening. All those activities are required to get the facts and statements needed to determine a good scope. This is where most companies stop their investigation. It is not until the first draft of the scope is written can true investigation take place. Once a project scope is on paper, business leaders need to invite all parties they can to “punch holes” in the ideas and to offer suggestions. Such activity should continue until no further improvements can be made.

Once a company has made it to this point in their scope definition, it would be appropriate to run trials. Where possible, paper versions of the “technology” should be used so that improvements may be discovered. Forms or worksheets should be made to resemble the layout of the purposed software which will be used by the employees. A company may even discover the paper versions are more efficient and easier to manage than any software system they could purchase. Deciding not to proceed with a technology purchase is a perfectly acceptable decision. The only reason to purchase a technological solution is because it will make employees more efficient, accurate, and the company more profitable.

I worked for an organization that utilized a rather large and well-known ERP system once in my career. In the department that I worked in, the system was only utilized for capital and maintenance accounting. It was clear that the system was built to accommodate a great deal more functions than the ones utilized by us. It was also clear ERP system was not user friendly or intuitive to operate. To access all of the information required, I would have to look at several different screens.

Work was further complicated by server reliability issues at that time. Files, mainly spreadsheets, would often crash while being used. It came to the point I no longer trusted my spreadsheet program on my computer and decided to use an old accounting ledger to make a paper copy of all the information I found useful.

As one might imagine, I received a great deal of jesting from my fellow workers...until the internet connection would be lost and someone needed my ledger. All the sudden the ledger was no longer a joke. The ledger proved to be the type of document that showed what type of information that I needed to see immediately, and the most useful way to present the information to me. It would have proven to be a great asset in conducting research for a custom system.

Chapter 7 – Inventories

Inventory management is usually a crucial aspect of every manufacturing operation. Every manufacturing facility is unique, but many of them share the same general issues in respect to inventories. Manufacturers must successfully manage raw material, finished components, finished goods, and spare parts for manufacturing equipment. If problems develop in any of those categories, the effects will make an impact on the bottom line of the income statement.

When surveying the ideas and special names surrounding known inventory management practices, it becomes clear there are generally two schools of thought. Those contrasting ideas could be simply labeled as “Just in time” and “Just in case.”

“Just in Time” inventory management is mostly utilized in automotive manufacturing, but its ideas and premise have been exported to many different types of businesses and situations. The idea of JIT inventory management is to have supplies and materials arrive at the manufacturing facility at the exact time in which they are needed.

The following story is a great illustration of JIT inventory management. I was once conducting a factory acceptance test at a vendor’s facility who designed and built conveyor systems for many different manufacturers throughout the US. Over in an adjacent bay to the one I was conducting my evaluation in, was a rather large looking semi-trailer insert with an overhead chain conveyor in a U shape built onto the frame. I remember asking about the machine to satisfy my curiosity. It was explained to me that it was a delivery system for car seats which would be utilized by a car manufacturer. The goal being that each seat (equipped with an RFID) would be loaded onto the overhead chain conveyor inside a trailer at the seat manufacturer’s facility. When

called upon, the trailer would back up to the car assembly facility, and a corresponding chain conveyor mechanism would attach to and drive the one in the trailer, causing the seats to be removed and loaded directly onto the overhead chain conveyor inside the plant. Each seat would then be scanned, and delivered to the seat station on the assembly line at the exact moment it was needed. The epitome of JIT inventory management.

The JIC (Just in Case) inventory management methodology is not really a known or used term like JIT. However, its concept is instantly recognizable. The JIC methodology aims to always have adequate inventories in case of some unforeseen event. An example would be the storeroom manager who keeps two spares of every part on every machine within the production facility. That is an exaggeration which would rarely happen, but the underlying premise is clear. Always be prepared for the black swan event. Every area of inventory, raw materials, works in progress, finished goods, etc. will have aspects that need to be considered independently of one another. In addition, there are advantages and drawbacks to JIT vs JIC in each case.

The reality which most manufactures face is that of competing objectives. These differences in objectives are the reason for these two inventory management practices. Depending upon one's position within the company, and what one's tasks are, will usually determine which inventory management system one is most comfortable with. Departments such as operations or maintenance are measured by production rates and downtime. The metrics used to judge their performance naturally incentivizes them to prefer a JIC inventory management system. Operations will never wish to find themselves without the raw material they require, nor will maintenance ever find it acceptable to not have a needed spare part at hand.

Contrast those ambitions with certain support departments such as accounting, legal, along with the owners and executives. Their metrics are usually financial in nature. Having a

great deal of inventory that is “not really required” drives up insurance cost which negatively affects the income statement, in addition to littering the balance sheet with “useless” assets and in some cases, liabilities. There are also tax considerations. Thus, many executives will prefer JIT inventory management practices where possible.

Raw Material Inventories

Raw material inventories should be a relatively easy topic to address. Most companies are aware of how much they consume in the production of their products and will order adequate amounts of raw materials and supplies accordingly. It should be that simple...but it is not. Executives continue to eye their logistics and supply chain departments with the intention of reducing expenses in order to obtain more profit for their organizations.

I know of one famous manufacturing company who operated multiple facilities throughout North and South America. Because all their facilities produced essentially the same product (just different variations and sizes) the executives of that corporation decided that it would be a prudent decision to eliminate the local facility raw material purchasing positions and move all raw material purchases to headquarters, thus creating a centralized purchasing department. It certainly seemed like a great idea, but there was a great fundamental flaw. Each of the individual plant purchasing agents was aware of the type of material packaging that their respective facility would be able to process. The corporate purchasing group was unaware that there were any differences in the facilities with respect to the infrastructure and equipment used to process the raw materials. Some facilities were able to accept taller supersacks than other locations could. Furthermore, some facilities had better equipment which would not degrade the product or introduce moisture. It took years to work through all the problems and small eccentricities that arose due to moving to a centralized purchasing group.

There are many ways that a company can poorly manage their raw materials. That story demonstrates just one bad inventory management practice. So, how should a manufacture manage their raw material inventories correctly?

When manufactures utilize the JIC model for their raw material inventories, they inevitably experience some disadvantages. Having additional raw material on hand in case of supply chain issues sounds like a good idea, but there are real consequences which will be experienced due to preparing for a supply chain disruption. (There are other ways to hedge for that black swan event which will be covered later.) Consider the cost of storage space. Facility space should be treated as an asset. Every square foot of raw material storage is a square foot where production equipment could be placed. It is not simply the cost of the building and utilities, but the opportunity cost as well which must be accounted for. As previously mentioned, many raw materials and supplies being stored on site can bring about higher insurance premiums. This additional cost must be considered because the increase in premiums brought about from storing some raw materials can be very costly, especially if the materials are explosive or flammable. One last consideration would be quality degradation. Some raw materials have expirations by which the material must be used to achieve the best quality. In addition, some materials may require special atmospheric conditions such as narrow ranges of acceptable temperature and humidity levels. Providing such storage conditions can be difficult to maintain and costly.

It would appear that a full-fledged JIC methodology is not the greatest inventory management style for most manufactures. Yet many are afraid to switch to a complete JIT model due to risks such as wrecks on the interstate, bill of lading problems, etc. If the JIT model is executed poorly (which is easy to do) then production of product may never run continuously in

a successful manner. That is why most manufactures should consider a JIT type system, with a “cushion.” This means they should inch toward JIT as much as they can, but always leave a certain amount of backup material within their on-site storage in case of “hiccups.”

Almost every manufacture understands the importance of FIFO, LIFO, and other inventory practices. They also understand to some extent the amount of raw materials their operations consume during a given period of time, predicated upon a specific production rate. Few manufactures go beyond that point. Critically thinking about raw material storage inventory takes data and effort.

For the company that is desiring to move toward a JIT management style in respect to their raw materials, they should start by collecting data. This data would include receiving times, consumption rates, how consumption and inventory levels change around holidays and weekends, etc. The most important aspect is to track the data for a long time, 6 months to a year. By utilizing such a long timeline, it will allow management to see and recognize special circumstances that they would otherwise not see in a shorter timeframe. In addition, conducting the long-time horizon study will allow management the opportunity to track new metrics and to change the way the study is conducted in light of new observations. By failing to conduct the long-time horizon study, management will fall into the all too common trap of producing statistically insignificant data, and making business decisions predicated upon that data. Once all the data is collected, and even while the study is being conducted, it should be analyzed mathematically. With the right evaluation, it should become relative straight forward to extract forecasting models for raw material deliveries and consumption that are accurate and conservative.

Raw Material Inventory Hedging

For those in the manufacturing environment who feel uneasy about letting go of the JIC mentality (especially within the raw material department) there are other methods available to them which do not require copious amounts of wasted storage space. The root cause of the unforeseen event is not a lack of raw product onsite, but rather a fragile supply chain network. Thus, manufacturing leaders need to address the root cause outside of their organizations, rather than placing burdens of large inventories on their own companies.

Building strong relationships with one's suppliers is essential to manufacturing success. It is a great relief to know inside information about a supply disruption four weeks before it happens instead of reading about it on the internet after it occurred. Managers need to insist that everyone within the manufacturing facility learns their supplier's counterpart, and regularly interacts with that person. Cherri in accounts payable at the manufacturing facility needs to know how Jill's (Jill works in AR over at the supplier's warehouse) kids are doing in little league. George, the manufacturing dock receiver manager, needs to know how Kyle's (shipping manager at the supplier's warehouse) woodworking is coming along. In fact, it would be a wise idea for the manufacturing facility to purchase one or two pieces for George's office! Strong relationships such as these can have great benefits. If a manufacturing facility's success is dependent upon its raw materials supplier's success (which it is) then the manufacturing facility should have its tentacles wrapped around every aspect of the supplier's business.

Relationships matter. People are people, and people move business forward, not machines or computers. If the manufacturing employees have strong ties with the supplier's employees, then waiting for procedure is no longer required. "Don't worry about it! I will simply call Jim over at XYZ chemicals, he will get this straighten this out for me!" Problems are handled quickly when all the support department employees within the manufacturing facility

have that sort of confidence concerning their relationship with the company's suppliers. The greatest benefit of all, the manufacturing facility may develop more sway with the supplier, even if the manufacture is not the supplier's largest customer.

Beyond relationships, there are other important factors to consider when attempting to contract antifragile supply chains and continuous raw material availability. A major component of the supply chain equation is shipping. Some facilities have process which only allow for one type of shipping method to be utilized. However, for those manufactures who have alternate choices, they should be utilizing them even if they are not required or prove to be more expensive.

There is a good reason for the extra effort. Consider the small manufacture who only receives raw material and supplies from a supplier which ships via UPS. There are any number of issues that could arise from the time which the label is created to the time that the raw material is unboxed within the manufacturing facility. Businesses which find themselves in such situations need to work with their suppliers and practice alternate methods of shipping. The reason for the "practice" is that if a black swan event happens and the typical UPS shipment cannot arrive on time, tried and tested alternatives need to be available immediately. Having contacts and procedures written down incase of an emergency can make the difference between profit and loss. These practice runs need to occur at least once a year. Once the manufacturing business has conducted the experiment successfully and has written down the procedures and contacts, it is important to share that information with the vendor in addition to the manufacturing employees. By doing so, both businesses will be better equipped to navigate shipping emergencies and the vendor will feel the work they put forth to make the exercise successful was worth the effort.

Another aspect of raw material inventory hedging is vendor diversification. There are those special manufactures whose raw material needs are so specialized, there are no alternatives to their existing suppliers. But for the rest of the manufacturing space, alternatives do exist and should be utilized. Relying upon a single raw material supplier for any one component of a production line is generally a bad practice. So why do so many manufactures ignore it? Reasons such as the ones listed below can commonly be heard.

1. Our current supplier works well with us, and those other guys are so big, they just don't care about us at all.
2. Our current supplier is the least expensive.
3. Our current supplier has better quality. We tried those other guys a few years ago, and their product caused us problems.
4. Why do we need two different suppliers, what is wrong with what we are doing?
5. Our equipment is not set up to use the other supplier's product. It would cost us some investment to get that going. We don't want to spend that much money.

The reality is that each of the previously mentioned reasons are valid points. Nevertheless, none of these ideas are larger than the risk that exist to a company who has only one supplier. The COVID-19 situation showed everyone that the global supply chain is fragile and if it ever stops moving or has a broken link, getting it back up and running can be a difficult process. If a manufacturing business finds themselves with a situation where they are completely pleased with their supplier, that is great. It would be prudent for a manufacturing business in that situation to find a second supplier with whom they can also develop a great working relationship. That does not mean that 50% of raw material purchases must come from each supplier, but it

does require enough product to come from the second supplier to maintain a working relationship which can be expanded at any time. Remember, all these steps and actions are being taken so the manufacturing business does not have to store more raw material than is necessary onsite.

Assuming poor product quality from a vendor necessitates their quality will always be poor is a false assumption. A manufacture should not let one bad experience, or personal purchasing psychology interfere with business decisions. The manufacturing facility which finds themselves in this circumstance should continue to purchase samples from their perspective second supplier every 6 months to test for quality. It will be the manufacture's responsibility to work with the vendor to bring their quality to the required standards. Any manufacture who does this will find themselves with a second supplier equal to the task of providing the correct quality of material and will be able to provide more product in the future due to their increase demand. A company should never quit just because someone else is failing.

The equipment concerns previously listed are easily addressed. A manufacture who finds themselves with a supplier who cannot ship their raw material in the correct packaging only has three options.

1. Find another "second supplier"
2. Have the material delivered offsite and repackage it,
3. Purchase the equipment needed to process the second supplier's odd packaging.

All three of those actions are acceptable.

Up until this point, the raw material inventory hedging strategy has been based upon improving relationships, adding a second shipping method, or second supplier. Why stop at two suppliers? Look at what happens when a manufacture adds three suppliers (the same idea works for shipping.)

Supplier A reliability 97.98%

Supplier B reliability 98.99%

Supplier C reliability 94%

The combined reliability of Supplier A and Supplier B is 99.979598%

The combined reliability of Supplier A, Supplier B, and Supplier C is 99.99877588%

For easier comparison, if Supplier A was the only supplier used, there would be 2,020 “misses” out of every 100,000 shipments. By contrast, if all three suppliers are utilized, only 2 misses would be experienced out of 100,000 shipments. Obviously, there are a great deal of assumptions in this example, but it goes to show the power of combined reliability as it relates to additional suppliers. These are the tools required to successfully reduce raw material inventories.

Works in Progress

It can sometimes be easier to think of works in progress as subassemblies in the manufacturing realm. That is how they will be referred to here. There are many manufactures who do not purchase raw materials or chemicals in the same state via which they are mined from the earth.

Most manufactures who utilize sub-assemblies or pre-made assemblies acquire those products by purchasing those assemblies from a vendor/contractor, or creating the sub-

assemblies themselves (either onsite or offsite.) There are many reasons why a manufacture would choose to contract out such services. Perhaps the manufacture does not have the expertise, equipment, or efficiency required to produce the components required for their finished goods. In many instances, it is simply a wise financial decision to purchase the part rather than make it.

The inventory of such assemblies is not just critical at the receiving dock door, but their inventory levels are critical at every station. These sub-assemblies, as they travel through the production facility, are becoming more and more like the finished good which is to be sold. Ensuring each workstation has the proper inventory level of sub-assemblies or works in progress is essential for production success.

Consider a two-station production system. A manufacture receives a circuit board, and then bends some sheet metal to house the circuit board. A very simple manufacturing process. The problem (in respect to reliability) with most manufacturing facilities is that the majority of the work done is accomplished upon an “assembly line.” This layout necessitates that reliability of each workstation presents itself in series; ergo, the more workstations that exist, the lower the reliability rate of the facility. The combined reliability of workstations in series lowers the overall reliability of the entire system.

This reality makes it clear, lost production time due to failure of sub-assembly inventory being present at each workstation cannot be tolerated. Companies who wish to utilize JIT systems for assembly inventories at their respective workstations (such as automotive manufactures) cannot have any issues with their systems. Their JIT system must be flawless executed. If a manufacturing cannot achieve such efficiency and performance, then they need to consider JIC style ideas in regards to keeping an abundance of sub-assemblies ready to go at each station.

Spare Parts

As an engineer who has installed millions of dollars of equipment over the past 20 years, my natural inclination is to keep no spare parts...but rather keep an entire spare machine plugged in and ready to go. That is obviously impractical and not realistic. That statement should bring to the forefront the dichotomy that exist between the desires of technical departments and company financial departments. Most employees in technical support roles are going to advocate for as many spare parts as possible, while in contrast, most of the employees in financial roles will advocate for the least number of spare parts possible. This difference in desires is almost universal across all industries.

Before judgements can be made to determine the best way to handle this situation, it may be helpful to evaluate more closely the viewpoints of each side. When a technical employee evaluates a machine to determine what spare parts should be kept onsite at the manufacturing facility, the following categories are usually considered.

1. What component or parts are “wear” items. Items which wear due to the action of the machine, or wear to contact with the material it is processing.
2. What parts move? Which ones have rotating elements or repeat motions. What parts in the chains of motion will wear out with so many cycles.
3. What supplies will the machine need, grease, oil filters, etc. These supplies are to always be kept on hand.
4. Are there critical instruments that the machine cannot function without?
5. Are there any possible parts which would have long lead times if required.

The number of “spares” to keep on site for any given piece of equipment is usually evaluated as a function of machine cycles and the expected life of the part. That sort of analysis should be applied to each of the previously mentioned categories.

That logic appears to be straight forward, so why do so many manufactures have storerooms with improper amounts of spare parts? Once again, conflicting objectives. In many manufacturing facilities the storeroom receives little attention from upper management. At least until the asset value being store in the storeroom starts to look “too large.” The goal of the managers and executives in the financial department is to keep the amount of assets and liabilities tightly controlled. Furthermore, assets which don’t produce product drive down certain key performance indicators and ratios. It should be clear, such financial metrics are a poor way to judge correct storeroom inventory levels. When business leaders start to reduce storeroom inventories strictly predicated on the growing of large asset values they see on a spreadsheet, they begin to do the company harm. The highest good that can be achieved from storeroom inventory levels is to keep an adequate supply of parts required to maintain machine and workstation reliability as close to 100% as possible. Such a goal financially outperforms “storeroom inventory reductions” which so commonly take place. If business leaders ever understand the mathematically power of series reliability, many things will change in the manufacturing space.

For owners and executives in small companies, making a shift in the way they view storeroom inventories can be as easy as them driving forward new polices. An owner can simply declare that the storeroom inventory levels are to be based upon the mathematical need. For those business leaders in larger organizations, pushing for such a change may prove to be difficult. Nevertheless, the fight is well worth the effort. If polices can be enacted in large

corporations concerning storeroom inventories, then overall manufacturing facility reliability can increase simultaneously across multiple locations. Such a change would have a profound effect on revenue, and subsequently profit.

For the executive or business leader within the large corporation who plans on making changes in this arena, presenting a case study, conducted at one of the company's manufacturing facilities, might be the best way to win over other executives. A prescribed method of data collection will need to be conducted and under certain circumstances.

The first step is to receive permission to conduct the experiment at one of the company's manufacturing facilities. Within that facility, a subset of the production line, comprised of multiple workstations (three or more) configured in series, should be selected. These workstations need to include equipment that is moderately complex and requires periodic maintenance for wear parts and supplies (filters, oil, etc.) Once this selection has been made, data analysis will need to begin. The leader of this experiment will need to search for and evaluate maintenance records, interview maintenance technicians and engineers. The main question which needs to be answered during this phase is "Does this section of the production line experience enough maintenance downtime and a lack of adequate parts in stores, that a change in inventory levels would make a material difference." If the answer to the question is yes, then the experiment is free to proceed. This action is not stacking the deck. The entire purpose of the experiment is to contrast, from a financial standpoint, the difference between properly stocked and not properly stocked parts for production equipment. If it turns the workstations which have been selected are equipped with an adequate supply of spare parts, then no contrast can be shown. Those areas will exist. If the experimenter has selected a section of "opportunity" to conduct his experiment on, then he is free to go to the next step.

The storeroom should be the next stop. Here the experimenter will need to determine all the parts that would be used for the equipment which has been selected. Next, a monetary value needs to be assigned to all the parts. Since some pieces may be used on other equipment as well, the cost of the spare part may need to be prorated across various machines to come up with a proper monetary figure.

At this point, a decision needs to be made concerning the maintenance records. If the maintenance records are extremely detailed and record the amount of downtime due to parts not being available immediately onsite, then conducting a current state study may not be necessary. In most instances however, maintenance records so complete will not be available. A long-time horizon study will need to be conducted in such cases. All maintenance activity and downtime concerning the equipment in question will need to be recorded for a period of at least six months. This data also needs to include the amount of production downtime caused by equipment failures which require maintenance to remedy. Lost production time should be assigned and equated to the amount of time required for correct parts to arrive onsite which should otherwise be within existing storeroom inventories. It will be crucial that the monetary amount of the parts and supplies used from the storeroom during this time is also captured.

While the present state study is being led, calculations can be conducted which will show what parts, and how many of each part, should be onsite. Meetings with the engineers, maintenance managers, and storeroom manager should all take place. A systematic system and set of equations should be developed predicated upon historic records and calculated expected part life, with the most conservative output always being selected.

Once the true amount of spare parts has been determined for the equipment being evaluated and the present state study has concluded, it will be time to purchase all the parts in the

proper quantities. It will be imperative for the storeroom manger to adjust the inventory minimums and maximums within his tracking software to reflect the new quantities determined. It will also be important to update any training and working standards with the maintenance technicians concerning part changes and PM frequencies. After the parts have arrived and have been stocked and the storeroom inventory system has been updated, the forward study can commence.

During the forward study, which should last for the same period as the previous current state study, two metrics need to have special attention assigned to them. The first metric is the amount of downtime assigned to not having the correct part on site. If the previous steps were successful and there are no catastrophic failures, this amount should be approaching zero. The second metric which needs to be recorded carefully is the amount of production downtime that is due to equipment failures. This amount may be close to the originally recorded values at the beginning, but should start to diminish as the recording period progresses.

With all this data, the experimenter will be able to show the difference in cost of storeroom spare parts inventory, and consumption rates. Obviously these two numbers will have grown and become larger. However, the overall series reliability of the selected workstations should also increase. If the financial value of the recovered uptime production is greater than the additional cost implications of the additional spare parts being onsite and their consumption, then it should be easy to prove the fact that properly stock storerooms are worth the “expense” and high asset values.

Such a case study needs to be presented in the most professional manner possible. Perhaps a white paper or a publication. It will be vital to keep this study alive within the company. As people start to retire and leave their positions, and new faces take their place, the

natural desires of the executives and financial departments will be to look at the “costs” of their storerooms as a target for improvement. This case study may be the only thing that will dissuade their intentions.

Finished Goods Inventories and Others

When most people think about finished goods, they envision neatly stacked products in a warehouse adjacent to the production facility which made them. These finished products simply wait there in anticipation for their chance to be loading upon one of those large trucks and to be carried away on their first road trip. That is certainly a nice and distinct image but is it really true?

There are those manufactures who have other types of “finished goods.” These are more than works in progress, but not exactly a complete product. For example, consider the guitar pedal manufacturing who has a case with all the knobs and cable connections built in. Once a order is placed, it will determine the circuit board that is to be inserted, and the sticker applied to the face of the case. It is a crude example, but it gets the point across. Many manufactures have more complicated operations. They may have “almost finished goods that have had over 1000 steps placed into them, but they are simply three steps from determining what they are before they are shipped. These are special situations and should be given the consideration they deserve.

There are some manufactures who do not currently engage in such practices that should. By contrast there are some manufactures who currently operate in this manner but should stop. It is up to the business leaders to evaluate their markets and manufacturing environment to determine which method would be suitable for their facilities.

Most manufactures operate by producing a certain amount of finished goods and holding them in a warehouse. The amount produced is based upon the sales demand, the warehouse space, and the production capability of the manufacturing facility. In many respects, this tried-and-true concept closely resembles a retail operation. Imagine a retail shoe store. Such a store must hold large amounts of inventory onsite. Every style must be stocked in various sizes and quantities. Inventory requires a large amount of physical space which must be purchased upfront. (Obviously many inventories are financed and have long payment terms, but these are still short-term obligations that most would consider cash like expenditures.)

In this shoe store, the owners must set on the product, day by day, and wait for the customer to purchase something out of the warehoused inventory. Only then can profit be realized. Such is the nature of the retail operation. The high cost of maintaining such inventory is what necessitates large retail margins.

In the same way, many small manufacturing businesses unintentionally operate their finished good inventories like a retail store. They produce as much as they can on their production lines and pay for large warehouse space while storing product for long periods of time, awaiting orders. This is the very reason that wholesale distributors were invented, to carry the warehousing risk and cost in exchange for a portion of the finished good profit margin. Since smaller manufactures do not have access to wholesale distributors, other methods to avoid large finished good inventories must be explored.

Almost every manufacturing operation must “adjust” its production to its sales forecast. If a facility runs four shifts 24/7 and for some unknown reason has its sales cut in half, it is impossible for them to continue to produce at that rate. Eventually, they will fill up their warehouse space and have to lease more space. This creates more expense in addition to the

declining revenue. If the cycle continues, the business eventually goes broke. The other option would be to layoff all of the workers and wait for better sales to return. Such an option is not feasible because employees will not wait to be called back to their production work, they will simply find other means of income. Obviously, the first remedy to such a situation as this is to increase sales, but beyond that effort, throttling the amount of production, ergo the amount of employees is the logical next step.

The best way to properly adjust both finished good inventories and the amount of employees required is to obtain accurate sales projections. Easy to write, difficult to accomplish. Even large fortune 500 companies struggle with accurate sales projections. This is where being small and nimble can be an advantage. The small manufacture can change the way they accomplish their sales projections, and can do so rather quickly. They should utilize the best and most accurate methods, even if they do not require technology! Large corporations could not change their methods or obtain sales projections quickly even if they wanted to. There would be layers upon layers of management, training, software changes, employees preoccupied with how to extract more commission given the new rules, etc. It would be an awful mess.

Here is one of the major flaws in sales projections and many other data driven forecasting models. The reliance upon historic time series data. This type of data is almost always useless and misleading. Most financial investment products will issue a warning to prospective investors. That statement usually reads something like “Past results do not in any way indicate future returns.” That statement is beyond being true, yet it is human nature to ignore it repeatedly at our own peril. Time series data is a poor indicator in many fields, most notably stock market returns! (For those who were just offended, I offer you the Laplace distribution.) In many cases historic time series data is all that is available to decisions makers, and therefore it is

tempting to believe that it has merit even in situations where it does not. Large corporations who utilize historic time series data in their sales projections forecasting models find themselves in grave danger of being wrong.

The smaller manufacturing needs to create for themselves a sales forecasting model that works for their organization. Remove all preconceived notions and start from scratch. The first step in such an endeavor will be to list all the possible variables one might attribute to affecting sales. It may be helpful to read annual reports of publicly traded corporations to see what they think influences sales. After the list has been made and each variable is listed, the next step will be to check for a statistically significant correlation between each variable and existing historic sales data for the company. This may involve the following comparisons as an example:

How does the nationwide unemployment rate correlate to historical sales?

How does regional specific unemployment rates correlate to historical sales?

How does the value of the dollar index correlate to historical sales?

How does freight cost indexes correlate to historical sales?

How does weather correlate to historical sales?

How does seasonality correlate to historical sales?

How does the price change of similar products correlate to historical sales?

How does the price of oil correlate to historical sales?

The small manufacture who is willing to discover what really affects sales should have a list which is much longer than the one above.

For the business leaders who do find variables which possess a statistically significant correlation with their historic sales figures, they have discovered a great thing. Now the only problem is forecasting all of those variables, and then building sales forecast off of the results.

This next suggestion as to how to accomplish this is going to be radical, and somewhat voodoo like, because how it works is not fully understood. It will be combine the notions of scenario planning (a legitimate statistical forecasting method) with brain networking.

It is a common story of how 100 people guessed how many marbles were in the jar. Everyone got it wrong, but the average of all their guesses was very close to the actual number. Brain networking in this context would be the same thing. I have used it with much success when estimating project cost for which none of the contributors had any experience in such projects. The entire group's average guess was within a couple of percentage points of being accurate after the bids come in. This is how to accurately forecast the probability of certain scenarios coming to fruition in respect to the variables that truly affect sales.

One must first understand the concept of scenario planning. This concept is truly exciting. The best way to teach this concept is through an example. For instance, say there were two variables identified by a manufacture which had the largest affect on their sales. These two variables were interest rates and drought. In this example, say the forecaster wished to assign three possible outcomes to the future of interest rate movements. These interest rates could Rise, Stay the Same, or Fall. Furthermore, there could be two possible outcomes when evaluating the future of possible seasonal drought. Those two outcomes would be Drought or No Drought. In this case, a risk analysis tree would be drawn as follows:

INSERT FIGURE HERE

Since there are three possible outcomes for the Interest Rate category, the forecaster would assign percentages to each outcome. The total of all those percentages must add up to be 100%. In the illustrated example, Rise was assigned a 15% chance of occurring, Stay the Same a 60% chance of occurring, and Fall was assigned a 25% chance of occurring. This means that each possibility has been assigned a proper value since the total of all those percentages is equal to 100.

Next, the same exercise would be repeated in regard to the Drought category. In this example the Drought scenario would be assigned 40%, while the No Drought scenario would be assigned a 60% chance of occurring. Since these percentages total to 100%, all possible outcomes have be accounted for.

The final step is to multiply the percentages across the tree. For example, a rise in interest rates multiplied by the possibility of drought would be equal to:

$$0.15 \times 0.40 = 0.06$$

This would mean that the forecasted probability of the future environment (in which the manufacture must attempt its sales) being in a condition of higher interest rates, while simultaneously experiencing a drought would be 6%. That same mathematical exercise would be repeated all the way down the tree. The total of all outcomes will equal 100%. As one can plainly see the two greatest possibilities would be that there will be no change in interest rates while there is no drought (36% chance of occurring), and the next highest probability of occurrence (at a 24% chance) would be no change in interest rates with the occurrence of a drought.

Once a forecaster understands the probability of the most critical variables falling into specific states, he can then use that information to see how those outcomes might affect sales. The way a forecaster comes up with the initial probability assignments for each variable is where the brain networking comes in. The first step is to assemble a team of no more than five people. More than five will make things more difficult and will add diminished benefit to the mathematical accuracy once more than five opinions are given. The next step is to ensure that these prognosticators understand the weight of what their decisions mean and takes the exercises seriously. The lead forecaster needs to come up with the possibilities for each variable, as was presented in the preceding example. The Interest Rate category had three possibilities while the Drought category only had two. Once the tree has been established with all of its categories and their respective possibilities, it would then be time to survey the team as to their thoughts. Each person on the team would be asked to assign possibilities as to what they believe the future to be like (say 6 months into the future) for each category one at a time. Jim would be given an email for example in which he would be asked to assign probabilities to what Interest Rates will look like 6 months into the future. Once each of the prognosticators submits their results, those percentages will be averaged and then a grand percentage will be assigned to each possibility that will go into the final decision tree. By performing the exercise this way, the forecaster will be able to obtain the most accurate future outlook that he can in regard to the variables that affect sales for the company. Then it will be up to the forecaster to evaluate the projection of sales predicated upon the historical correlation of sales with those critical variables that were used in the scenario planning forecast.

“Almost Finished Goods”

Not every manufacturing environment is the same. However, in some industries, “green” products are utilized. These products are what would be referred to as “almost finished goods.” They would only require a few steps before becoming a finished good and could be so worked on to become a certain variation or model based upon the remaining work performed or the types of components that might be installed. Not every manufacturing environment can utilize this technique, but there are smaller manufactures who might find it advantageous who are not currently aware of the concept.

Consider the following hypothetically story as an illustration as to how “almost finished goods” can help a manufacture. Once upon time, there were two guitar pedal manufactures in the town of Nashville, TN. Guitar pedals are simple foot operated electronic boxes that an electric guitar player utilizes to change the sound coming out of his amplifier. Both of these manufactures were capable of producing products of the same quality and demand.

Manufacture Bad Kitty (that sounds about right) simply purchased all their components separately and kept them in storage. They had metal boxes, switches, jacks, stickers, circuit boards, wire, etc. all in storage. If no orders were coming in, there was downtime on the production line. This meant that workers were idle, and little was going on in the shop. On those occasions that orders did flood in all at once, it would take a long time to get the production line and the employees up and running again. Since every, pedal was being created from scratch, the lead times kept getting longer as more orders would be added to the first rush of orders. Customers would often become impatient, and some would even cancel their orders.

Across town, the other manufacture operated a little differently. Manufacture Axe Slayer (that is a good one too!) also purchased all their components separately. They also had metal boxes, switches, jacks, stickers, circuit boards, wire, etc. all in storage. Were they achieved an

advantage was in the way they operated the production line. The employees over at Axe Slayer built “almost finished goods” while waiting for orders to come in. Their product design allowed for them to make an entire product complete with switches, cable jacks, and most of the wiring minus the circuit boards and stickers (these two items were selected based upon the customers’ orders.) When Axe Slayer received a large amount of orders flooding their shop, they were able to keep up with the demand.

What Axe Slayer was able to accomplish through this method of warehousing and manufacturing was genius. When they had to warehouse a “finished good”, they were not just setting on one type of guitar pedal, but many. For the same amount of space, for the same amount of leased cost, one single unit could be 5 different units based upon the demand. What’s more, they were able to keep a more balanced and “right sized” workforce employed all the time without having to go through hiring cycles predicated upon business cyclicity. This process also allowed them to experience more forgiveness in their sales forecast, which proved to be difficult with their business and product.

Once raw materials land on the dock, the clock is ticking. Manufacturers of every size should utilize their space, time, and manpower efficiently as possible. Producing almost finished goods as quickly as possible is one of the greatest ways to realize such efficiencies. By nature, it reduces the amount of time required to make a sellable product, it utilizes manpower efficiently, and it multiplies finished good warehouse space without additional cost of construction or leases. Manufacturers may have to create additional administrative procedures to finish the stored units, but that cost is worth the trade off in most cases.

ASRS

The concept of ASRS, or better known as Automated Storage and Retrieval Systems is used primarily by warehouses, distributions centers, and large manufactures. These systems usually consist of some sort of automated machine or robot that scans a product, inducts the product into a large storage area, and another robot or machine will often retrieve the product and deliver it to another location, often opposite the side of the induction. When operated and utilized properly, these systems can create a wonderful environment and can really help efficiencies within a production facility or a warehouse facility. There are also times where these systems are installed and implemented horribly, and for some reason scheduling departments in manufacturing facilities have issues understanding the mathematical realities and constraints in which such systems must operate.

The first mistake that many facilities make concerning their ASRS is during the purchasing phase of the project. Most manufacturing facilities do not have the time nor the internal capability of creating a ASRS system inhouse and even if they do, the cost to do so would often prove prohibitive. That is why many manufactures turn to specialized providers and integrators to design and build ASRS custom solutions for their facilities.

When a manufacture approaches a vendor of an ASRS, they usually want that vendor to come and conduct a study of their facilities “flow.” In such cases, the manufacturer is relying upon the expertise of the vendor to produce an ASRS system that will be capable of sustaining the “product flow” that will be placed into and extracted from the ASRS system. These vendors will often only program their ASRS systems based upon their observations during their visit, and any subsequent data given to them by the manufacture. That information will then be used to alter their base code in hopes that the change will satisfy the needs of the facility. This package is

then sold to the manufacture and installed. What is never discussed is the mathematical constraints of these systems.

Even if the ASRS is programmed correctly, problems may still arise. Because the production scheduling department does not understand how the system was designed from a mathematical standpoint, they often end up under utilizing the system, or “choke it” with too many of one product. Despite the fact that few people realize it, each and every ASRS in existence is a giant math problem. There is PhD level combinatorics and various methods of discrete optimization occurring in these systems. The moment that employees interacting with that system fail to respect that concept is the moment that these systems start producing problems. Consider the small list of questions that a vendor may ask before designing an ASRS solution:

1. How many products can the system store?
2. How many different product codes will be used?
3. Are there product codes used more often?
4. What is the footprint and layout of the system?
5. Will different product codes be stacked in the way of others due to layout constraints?
6. Will double, or triple movements be required for storage or retrieval?
7. What is the shortest cycle time that the induction system can experience?
8. What is the longest cycle time that the induction system can experience?

9. Does seasonality influence how product codes should be store predicated upon ejection call frequency of certain product codes?

That is just a small sample of questions and concerns that would need to be addressed before a proper system could be designed. The answer to every question is part of a larger discrete optimization problem that must be solved for mathematically. Each answer must be considered in light of the others, tradeoffs must be made. These evaluations will determine how the entire system is programmed. Unfortunately, for most manufactures, these ASRS providers will be unwilling to explain in detail, or allow the manufacture's engineers to see how the system is programed. That code will usually live hidden in a "black box." This is done for two reasons. First, the provider does not wish to have the system acting in approved ways due to a code change. If the ASRS does so, it could cause issues ranging from poor efficiency all the way to complete mechanical failure. No vendor wants to look responsible for that. The second reason is due to the desire for continued support revenue. If the manufacture must call the provider every time a code change is required, then that becomes a steady stream of recurring revenue.

Most ASRS vendors are highly skilled and reputable providers. Nevertheless, once their systems are installed, they leave town. That is the nature of their business. The manufacture will end up with a system they know little about and with employees who do not understand exactly how it "thinks" and the assumptions that had to be made in order to design it. It is vital that operations, warehouse, and scheduling employees all have in depth training with the ASRS provider before and after installation. The additional cost will prove to be well worth the effort.

Having in depth conversations about how the system is designed and trying to understand the complex math behind the optimization problems that must be solved are essential. Even if the manufacture must hire a local graduate student to assist in the conversations. Manufactures must

understand if the vendor is planning on putting forth the required work up front to build them the correct solution, or if they are planning on just selling a canned system and changing the code a little.

In summary, the way a manufacture handles its inventory effects everything. Cost, profit, space, employee head count, all of it is affected by inventory management. Carefully considering what can be done to improve, and using some unconventional thinking can produce profound changes one the financial statements.

Chapter 8 – Industrial Engineering Section

Industrial engineers serve a special purpose in many industries. The restaurant industry will often hire industrial engineers to study their workflows in the back kitchen, in the drive thru, and how many steps it takes for the frontline worker to retrieve the food. Chick-fil-A is famous for hiring such firms to help them achieve the speed and efficiency that they possess. The industrial engineer is also at home in the manufacturing facility. Their purpose is to plan out production lines, observe established process, create improvement projects, etc. The tools of their trade often involve data, clipboards, and stopwatches.

While smaller manufacturers may struggle to afford a full team of industrial engineers, they cannot risk failing to utilize their services. Having someone systematically going through a production facility on a routine basis and making data driven observations is critical for manufacturing success.

This chapter is going to be somewhat technical in nature. It is important that manufacture leaders have real concepts and real tools to affect change and increase profits in their organizations, and that is what this work is all about. Throughout this chapter the term “station” will be used. That term can be simply defined as any workstation within the production facility. A station may refer to a piece of equipment, a worker, both a worker and a piece of equipment working together, or an entire process line. It is a portion of the manufacturing facility that is distinct with boundaries and limits, in which proper studies can be conducted. A station is a place where output per unit of time can be quantified. It is really that simple.

Another term that should be explained is that of reliability. Depending upon the industry and the nature of the manufacturing process, this term may have different connotations, and that

is fine. The important thing to remember is that the mathematically way that a manufacture defines reliability for their facility is the same across their entire facility. Typically, reliability is going to be defined as the amount of time that a station is able to produce product per the amount of time that the station is called upon to produce product. If station A23 is supposed to produce for ten hours straight without any interruption, yet only is able to produce for 8.5 hours due to machine breakdowns, then a percentage can be calculated due to both measurements being in the same units. Smoke breaks and texting the girlfriend is not included in that calculation.

There is an important caveat to the above-mentioned topic. The nature of the downtime must be precisely known. A machine being down due to a lack of inventory or incoming product is not the same as a machine breakdown. These are two different types of downtime and need to be treated as such, all the time. They should never be combined because the solution to those two problems can never be combined. Each manufacture will have its own special nuance that will need to be accommodated for, but the basics remain the same for all.

Accurate data is important. Acquiring accurate data would seem to be straight forward. It evidently is not. I have seen many facilities make mistakes in acquiring reliability data. Some facilities will have computerized data interfaces for their operations employees to enter the reason for their downtime. While good in theory, this is usually a terrible practice. I have witnessed such systems be abused to great lengths by both the employees and the staff. Often, the operations employee has no real incentive to choose the correct reason for their downtime, therefore the most easily reached button on the screen will usually be utilized. It is often the part of the screen that is dark and stained. Many times, with such systems, when the raw data becomes aggregated, wrong conclusions are often reached. Management believes that certain equipment is proving problematic. Engineers and maintenance personnel are dispatched to work

on equipment that is not problematic or showing symptoms. Engineers will change the display of the interface so other equipment will show up in the dark spot of the screen. Three months later the reported problem goes away, and a new one shows up. Reporting to executives becomes skewed and inaccurate, causing poor allocation of capital. Truly problematic equipment goes unnoticed due to attention being driven toward other equipment. Very little good ever comes from such systems.

It is always a mistake to place the burden of data collection on operation departments. Their number one goal should be their only goal, and that is the safe production of product in the most efficient way available to them. Companies who continue to engage in the practice of “responsibility shift” often reap the rewards. The only true way to ensure that accurate data is collected regarding reliability is with a set of eyes, a stopwatch, and a clip board. Despite all the technology that is available to the modern factory today, nothing can replace the accuracy of those methods.

The business leader who is forthright enough to champion such data collection methods will often be met with resistance. Detractors can be heard echoing the cry of oppression. “If we have men stand around with clipboards, it will affect the employee’s behavior and the data will be skewed.” To a degree, that is true, but it is still far better than any other alternative that is currently available to the manufacturing business leaders. Some business leaders may opt for a more technological approach to the same idea, but it has its own set of disadvantages. By installing an array of high-definition cameras throughout the production facility, one would be able to watch each station in real time in addition to recorded footage. This would initially bring about the same effect of skewed behavior upon the employees. However, such an installation

would allow for any workstation to be evaluated at different times, potentially conveying more statistically significant data.

Series and Parallel Reliability

In the previous chapters the concept of series and parallel reliability was discussed in respect to vendor selection and production line planning. In order to have a more complete understanding of that concept, it is important to understand how the math truly works behind those concepts. After reading this section, it would be prudent for you to go back and read those previous sections. The reason that the mathematical concept is presented here in this chapter is due to the fact that these calculations should be performed most often by industrial engineers. For founders and business leaders starting and building new manufacturing facilities, they also need to understand these concepts.

To begin with, it will be best to present the series reliability calculations first. Mathematically, these series reliability calculations work similarly to the way a series system would be calculated in a circuit with resistors, or a multistage pump system. As an example, when evaluating production line reliability, the of one workstation would be multiplied by the reliability of another workstation, all the way down the production line. The resulting product would then be the overall reliability of the entire production line (assuming all the work moves through the workstations in a series like manner.) See the following equation

from the book Concise Reliability for Engineers by Jaroslav Mencik

$$R_T = R_1 \times R_2 \times R_3 \dots R_n = \prod R_j$$

Equation 8-1.

Consider the following example. Imagine a production line with ten distinct workstations. The uptime reliability of each workstation after a study was conducted turned out to be between 87% to 95%. That is fairly good, and any manufacturing facility would be glad to see such numbers. Below is a table showing that data:

Station	Station Reliability (%)
A	94.32
B	93.53
C	94.73
D	87.99
F	92.66
G	94.63
H	88.96
I	93.01
J	93.12
K	90.99

Table 8-1.

If these numbers were to be utilized in Equation 8-1, then the total reliability of the entire production line is only 45.22%. That means that every station is operating at the same time only 45.22% of the time. All other times, there is some station (or multiple stations) that is down due to maintenance issues with the equipment. More about these results latter.

Consider the following experiment. The manufacturing leader that was over this production facility examined the results of the calculation and decided to take action. This business leader instituted changes in the plant's preventive maintenance program, stocked to storeroom to the gills, and hire one extra maintenance employee. Within 3 months, this man was able to raise the reliability of each workstation by 1%. Now, Table 8-1 would like something like this:

Station	Station Reliability (%)	Updated Station Reliability (%)
A	94.3256	95.3256
B	93.5328	94.5328
C	94.7347	95.7347
D	87.9915	88.9915
F	92.6614	93.6614
G	94.6333	95.6333
H	88.9618	89.9618
I	93.0158	94.0158
J	93.1212	94.1212
K	90.9902	91.9902

Table 8-2.

By utilizing the new numbers from the Updated Station Reliability study, and redoing the previous calculation. The resultant product from Equation 8-2 is 50.36%. That is a 5% increase in total production line reliability.

There are many conclusions that managers should be able to draw from these examples. First, consider that 5% increase in reliability. A person that is unaware might have thought that if each station was 1% better, that it would be reflecting in the outcome of the equation in a more pronounced way! However, due to the nature of the math, that is simply not the case. Was it still worth the effort?

How much is an extra 5% of run time on this entire production line worth? Imagine that each time the entire production line is running with no interruptions, that time is worth \$500 per minute. Assuming that the operation is open 33000 minutes per month then you are looking at 5.14% of 33000. That figure is approximately 1696 minutes multiplied by \$500 is equal to \$848,000.00 per month, or \$10,176,000 per year! The salary of that extra maintenance employee wasn't that expensive after all!

Notice that all of the reliabilities of the individual workstations were between 87% and 95%. However, the total reliability of the production line was low...just 45.22%. In other words, more than half of the time that operations are taking place on this production line, some station is down for maintenance issues. How does one overcome that type of “gravity?” This is where the math has to guide you. Here are the only options that are available to you if you wish to increase the output of Equation 8-1:

1. Decrease the number of stations within your production line.
2. Increase the reliability of the stations in your production line. (Like the example above.)

In the light of the series reliability reality that Equation 8-1 describes, these are the only two options that are available to manufacture leaders. Nevertheless, that does not condemn the manufacture to an existence without creativity! In previous chapters, discussion about sub-assemblies and works in progress were presented. These ideas are critical when looking at the series production line. By ensuring adequate “cushions” of inventory at every station, the overall line reliability will be affected to a lesser extent if the failure of a workstation were to occur. For manufactures that wish to implement such practices, it is critical that each workstation can produce more output than the next station can digest.

This is where almost every production facility in the world fails. When presented with a production line where some workstations are faster than others and are so scheduled to allow for cushions between stations, yelling ensues! “Why is this poor efficiency tolerated? What are the bottlenecks?” are common refrains from the C-suite. It is common for a new plant manager to be dispatched to such a facility, along with his marching orders. A list of KPIs all exclaiming the

same sentence that clearly states in bold letters “Remove the bottlenecks.” Executives and other business leaders do not understand why someone would purposely allow for cushion between stations on a production line.

One can easily understand their position. If everything was running as it should be, then there would be no need to have such cushions. If every station within the series production line would simply perform at 100% reliability, then JIT scheduling could be utilized, and the line could be speed up to produce more product. That is very true. However, things do not always work and run as “it should be.” Machines break, obsolescence is real, and murphy is always lurking. For manufacturing facilities that have received improper amounts of investment, pulling them full tilt into an expectation of 100% reliability on every workstation does not work out well. Sure, the goal is to be applauded, but the workstations must be indexed to 100% reliability in a manner of degrees and not all at once.

If they hypothetical plant manager walks into a production facility and examines Station H only to find that it has an 85% reliability, he will obviously be tempted to fix it and focus all attention upon that one workstation. If Station H is completely rebuilt and starts outperforming every other station in regard to reliability, then the “bottleneck problem” simply moves. What’s more is that once that has been accomplished, the amount of sub-assemblies must be adjusted, often at multiple stations in order to maintain the balance of the series production system. When that new scheduling is unaccounted for, then it makes the efforts of the improvement look mute. It is unfortunate that most manufacturing facilities operate in that exact way. They simply hyper focus on one station instead of the line as a whole, and once improvements are made to that one station, they fail to schedule around it correctly. This is one of the reason many large

manufacturing environments fail to ever see manufacturing plant capital injections ever yield the type of ROI promised in the proposals submitted in order to obtain the funds.

The Equation 8-1 makes it perfectly clear that improvements to just one workstation within a series system cannot be accomplished without careful consideration. Proposed changes on one station must always be evaluated in light of how the entire production line will be affected. Now, this also begs the question, would small improvements across all stations be better than large improvements to one?

Recall from the previous example of the man who made a 1% improvement across all of the workstations within his facility. His overall increase on the entire production line was raised. Furthermore, it was raised in a way that did not dramatically affect his scheduling. Therefore, he was able to realize his gains without the pain of experiencing “shifted problems.”

How then should managers and owners think about improvement and capital investment? It would be wise to first look at how to increase non-maintenance reliability at each station first. After those improvements have been made, it is then correct to start addressing maintenance related reliability issues at all stations. Not until all of these activities have been completed should capital investment in new or redesigned workstations should be considered.

Parallel Systems

The nature of the parallel system is different from that of the series system. In previous chapters where vendor redundancy was presented as a way to shield the manufacturing facility from black swan supply chain events, the concept of parallel systems was introduced.

Once again just like in evaluating resistors in electrical circuits, reliability evaluated in parallel configurations works in the same way. With the increase in possible stations for work to

pass through, there is an alternative. As more stations are added to a parallel system, the reliability increases. That is the exact opposite of how the series systems works. Notice the equation below:

$$R_T = 1 - \prod [1 - R_J]$$

Equation 8-2.

Notice how powerful this equation is. If a manufacturing just had three stations in parallel all experiencing a reliability of 60%, the overall reliability of the parallel system would be 93.6%. That is extremely powerful results. Perhaps this knowledge should be used to the advantage of more manufacturing environments.

When the casual observer of such a system considers how it works it makes common sense. If a manufacture has a completely redundant station that can do the exact same thing, then the facility's ability to keep producing work is rarely affected. For many manufacturing environments, the financial case to purchase completely redundant systems does not make sense. However, purchasing equipment that can work as a redundant workstation in addition to performing other task can prove beneficial, and often times a good financial case can be made for such a piece of equipment. Thinking about parallel systems should also affect plant layout and the flow of the production line through the facility.

There are many complex manufacturing arrangements. It is often the case that a simple sub-assembly will require a complex mix of components and parts. The modern manufacturing environment is not simply a series system from the receiving dock to the shipping dock, nor is it littered with redundant workstations throughout its footprint. Rather it is often a mixture of these type types of systems (series and parallel) integrated together. The manufacturing facility is often

split up into different departments, each with their own unique combination of series and parallel systems integrated together. For those wishing to take an even large view, many manufacturing companies utilize different facilities in different locations to build unique parts for final assembly.

These concepts of series and parallel reliability are easy to understand in the classroom, but utilizing them correctly out on the production floor requires careful consideration and judgement. For those business leaders who have employees that may find these concepts new, it is best to start small. Focus on just a few stations at a time and work through the facility, until more comfort is acquired, and positive results start occurring. For those manufactures who follow the math and take action based upon their findings, they will be the ones who experience more reliability in their facility, and as a result...larger profits.

Benchmarking

Benchmarking is simply the task of recording the amount of production per unit of time for a particular location. Often this is a workstation or an entire section of a production line. Benchmarking is an essential task in the manufacturing facility. Knowing what production rate particular workstations are capable of is crucial for proper scheduling and planning within the production environment. Workstations are not the only view that should be taken for recording benchmarks. The entire production line should also be evaluated. In addition, there are many other metrics that can be benchmarked within the manufacturing facility. Without benchmarking studies, understanding reliability and being able to track it properly cannot be done. Furthermore, there is no other way for business leaders to measure the results of implemented changes in the hopes of improving reliability without conducting studies on workstations. Below is a small list of what you should be tracking every time you evaluate a station.

1. What is the total production time available to this station? (This is excluding breaks for employees, die changes, etc.)
2. How long does setup time take? (This may be start of shift checks, or die changes, etc.)
3. How much work per unit time can the equipment produce?
4. How much work per unit time can the employee produce?
5. How much time is spent troubleshooting equipment?
6. How much downtime is spent due to down equipment?
7. How much downtime is spent due to employee getting supplies, parts, etc.

This is a basic list of questions and concerns that should be evaluated when conducting a benchmarking study, but this list is by no means exhaustive. Manufacturing leaders should carefully consider every metric and determine what they wish to track before conducting benchmarking studies. Certain industries may have special metrics that are unique to them.

Ideally, this type of data should be collected over an entire shift, or for multiple shifts. In an effort to ensure that the collected data is statistically significant it is vital to “spread out” unique variables that may otherwise skew the data. Perhaps benchmarking the same workstation on different days of the week or utilizing different operation employees at the same workstation. No matter how it is accomplished, the main takeaway is to ensure that the benchmarking studies being conducted make use of the best experimental practices.

It is important that employees know what statistically significant data is. Most employees in manufacturing environments do not understand what statistically significant data is, and

therefore they consider all data holy.... when it is not. Manufacturing leaders have a responsibility to teach their employees about what good data is. Watching a piece of equipment operate for a total of 8 hours spread over 4 shifts is not statistically significant enough to ask for capital funds of \$2 Million dollars. Yet, someone will do that this month in some company...and it will get approved. For those business leaders who have conclude that advance mathematics are not their strength, a healthy dose of suspicion and common sense can keep a leader from digesting poor conclusions drawn from statistically insignificant data.

One more important aspect concerning benchmarking. Studies should be conducted on a periodic basis. The same study conducted on a work station in January should be conducted again in May, and November. If business leaders stay consistent with conducted benchmarking studies in this manner, the actions that need to be taken will become clear.

Plant Layout

This is an important topic. Many manufacturing facilities find themselves at the mercy of their floor layout. I have often heard of large corporations purchasing old buildings and trying to fit their production lines into them, that often works out poorly. I have also seen corporations build new manufacturing facilities, and with each new generation of facilities, they learned something important and implemented into the next design. This is the type of behavior that all manufactures need to copy in regard to facility layout.

There are case studies and books devoted to this type of science. Manufacturing leaders and owners need educate themselves in such topics. Having a through understanding of plant layouts and how they affect production rates are extremely valuable. In most cases, manufacturing leaders will not be able to change the footprint or layout of their facility due to

physical limitations (i.e. walls, utilities, etc.) or because it would be too cost prohibitive.

However, if manufactures notice that changes that they can make concerning production line layout, and follow through by taking actions based upon those observations, then improvement will come. Small changes compounded over time can lead to huge improvements.

Once I saw a dry chemical company utilize the idea of plant layout improvement, albeit, on much larger scale. This company utilized a certain manufacture process which always required that their raw materials to be consumed on the second and third floor of a production facility. Most of these chemicals would arrive via semi-trailers in supersacks. Almost every production facility of this kind, no matter which company owned it, used a freight elevator to transport the supersacks of raw material from the first floor to the other floors for staging and usage in the manufacturing process. Due to a certain project that I was working on, I was given the opportunity to visit a newer generation facility, one that had been recently constructed. To my amazement, when the construction of this facility took place, they construction crew moved large amounts of earth to build a gradual ramp which placed the receiving dock of the raw materials on the second floor of the facility. This improvement seemed so obvious, yet it had never been done before to my knowledge. What a huge improvement, seeded by a simple observation.

The layout of that facility certainly highlighted a well-known truth. Reducing the space between work station placement and the material that station will be using is a critical tenant of plant layout. That principle is not to be used just for the beginning of the production process, but rather it is to be practiced at every location and workstation throughout the production facility.

Another aspect of plant layout that executives should consider is building ceiling height. Ceiling heights that are too low can become a huge constraint on engineers and possible

equipment upgrades in the future. It is tempting for manufacturing executives to ignore this warning. Afterall, taller ceilings really don't improve production rates, and the extra space always costs more to heat and cool. In addition, lifts and special equipment is needed when working in the ceiling to run utilities, constantly driving up costs. Often buildings with higher ceilings cost more to build, purchase, or lease. All of these statements are true. However, on the occasion that a new technology is developed, or new automation is desired, the additional ceiling height will serve the facility well. All of that "additional cost" will be offset by the improvement from the new technology in short order. Perhaps a new ASRS will be desired for finished goods or maybe a new 5 axis cobot will need to be mounted upside down to assist workers. This is not a statement of opinion, but one of experience.

Room for expansion is another important consideration for manufacturing executives. It is often best to purchase, build, or lease facilities with foot prints large than what is required by the manufacturing process. If the manufacturing, raw material storage, and finished good storage can be accomplished in just half of the facility space, that is great building. The extra space can be partitioned off and the climate control equipment can be shutdown in that area to save money. It could be subleased. That area could be saved for future expansion. Supplier vendors could be invited to set up satellite shops onsite to assist in supplying the production line. There may be new technologies which require the footprint of the production line to grow larger. The possibilities are vast, and the extra space will not be wasted.

When contemplating locations for new manufacturing plants, it's essential for executives to factor in utility load requirements. The special word there is "requirements." For those executives that understand that production lines may need to expand, or change quickly, having more than adequate electrical supply is essential. With current trends and advancements such as

artificial intelligence, it is vital to consider the rising power demands of chips responsible for software operations. These components are likely to permeate industrial application very soon. If a facility is chosen which has only enough electrical supply to power the originally plan production line, then expansions and new technology adaptations will become more costly in the future. Additional gear and bus ducts are easily solvable, but line voltage coming from the supplier is more costly to upgrade. It makes more economic sense to choose properties where additional electricity capacity is readily available and installed.

Another point regarding electricity: With extensive media coverage on sustainability goals, along with local, state, and federal tax incentives, there might be a temptation to consider solar power as an alternative energy source for facilities. However, it remains true that the sun's azimuth—or optimal angle of incidence—doesn't align correctly across most regions of the country. Excluding areas such as Texas or Florida, where ample sunlight is available, few regions in the United States receive enough solar exposure to justify a reasonable return on investment (ROI) for solar panels as of 2024. Additionally, current technological limitations, which can be quantified mathematically, suggest that this approach may not yet deliver at scale. With exception of powering office building loads, or augmenting lights for distribution sources the amount of power from solar simply will not be enough in most instances. Most vendors of these products and services will disagree, but it is in their financial interest for them to do so. Manufacturing executives should do independent research on these matters before making such investments, even if it requires them to buck the trend.

There is another commonly overlooked aspect of smaller manufacturing facilities that really should be given more attention, that is the location of dock doors. The location of docks within a facility will have a great impact on how materials and supplies flow through the

production line. Thus, the shape of the production is usually influenced and shaped by the location of the dock doors within the facility. Furthermore, Dock doors are often located in a building predicated upon the land around them. If the property on which the facility is placed is not very large, turning radius of semi-trucks and trailers must be accounted for, and that is often a determining factor in the locations of the Dock doors.

Most manufacturing facilities will have a need for docks to serve the following functions.

1. Raw material and supplier storage (Receiving)
2. Storeroom (spare parts and maintenance area)
3. Shipping (finished product storage)
4. Bonus – Misc.

It is often best to plan out the production line layout first, and then start searching for a facility, or build a facility around that layout. Companies that deal in computer simulation can be a great aid to help visualize this. I have heard and seen of some design and engineering firms that are showing clients their future facility through augmented reality. This way they can walk through their own facility with all of equipment and stations set up, yet all of the equipment is just virtual, easily moved and reconfigured. Depending upon the size of the operation, such simulations may prove to be a wise investment. Especially, if management is considering purchasing equipment that is so large that it cannot be easily moved in the future. If there are dock doors in unfavorable locations, and the land allows for it (due to the turning radius constraints discussed above) then it will almost always be prudent to pay for those to be moved to other locations. Even for those manufactures that find themselves in lease agreements for their

building, it is still beneficial to put up the cost of the investment if the managing facility owner approves the project.

The goal in planning the layout of your production line is to decrease the time it takes employees or machines to physically handle raw materials, sub-assemblies, and finished goods. Reducing the time, it takes from material leaving a truck till the time that it can be processed is essentially to more profit. Production time starts the moment the first worker goes to retrieve raw material and supplies from storage inventory. Reducing that time by seconds each time is a worthwhile improvement in many instances. This is one of those variables that almost every manufacturing facility can improve.

Touching upon the production line layout, there is another consideration that managers should pay special attention too. That is the fact that in some manufacturing industries, manufacturing equipment has special foundation requirements. In addition, many production lines consists of large conveyors, in conjunction with huge equipment. Such production lines cannot be practically moved once the anchors are set. For those finding themselves in such a situation, the expense of the augmented reality configurations as mentioned previously may prove to be well worth while. Imagine making a poor decision that may cost a worker an extra 10 seconds every 5 minutes for the next 36 years! When dollars are calculated in regards to that lost time, the figure becomes rather significant. Lost time on a production line can also end up being propagated throughout the entire line, thus magnifying itself in later stages of production.

Some industries lend themselves to manufacturing equipment mobility. The parts that they produce are so small that the manufacturing equipment that is used to manufacture the components can be moved within the facility if ever required. Examples of such industries would be gun manufacturing, small plastics, finished cardboard displays, etc. Obviously, the phrase

“easily moved” is relative, but such production lines usually consist of fragmented production lines that are built around unconnected workstations. In such an environment, it proves beneficial to structure utilities throughout the facility. Planning for additional utility connections will allow for maximum flexibility in future endeavors. There are many equipment vendors who are now selling manufacture equipment with quick disconnect plugs for both electrical and air power.

Future production layout changes may be required due to new products, new manufacturing technology, a newly discovered efficient production layout, etc. When the production facility is built with such flexibility designed into the building, the rearrangement of the manufacturing equipment can be facilitated in a relatively short amount of time. Almost every manufacture, no matter their size, will come to a point where they will wish to change the layout of their production line. Planning for that day ahead of time can be a huge advantage.

No chapter written on the subject of industrial engineering would be complete without a presentation on kaizen and continuous improvement initiatives. The concept of kaizen originated with Toyota motor company back in the early 1980s. Essential, the idea behind this improvement methodology is to make small and incremental changes as often as possible. The theory being that overtime, these small changes will begin to have a cumulative effect. These concepts are great and should be implemented in every production process. However, almost every production facility in existence institutes their continuous improvement initiatives poorly.

It is common for most kaizen metrics to be crafted by upper management or owners. Many executives when first introduced to the idea of kaizen, are immediately whisked into a frenzy state due to the newly discovered knowledge and power that the methodology promises to provide. Such emotions from the company executives often lead to poorly crafted kaizen metrics or Key Performance Indicators. While creating metrics is certainly right, upper management

rarely has the visibility that is necessary to prescribe such accountability without screwing it up. Nor should they be expected too.

It is very common for continuous improvement activity to be measured by the quantity of activity that is taking place rather than the profitability of the activity. This is usually symptomatic of manufacturing employees being too far removed from the financial outcomes of the facility. Any executive or owner that attempts to apply kaizen methodology through top down dictates should reconsider their approach. Most likely, it is accomplishing nothing other than spoiling morale and wasting precious time that could otherwise be utilized on other activities. Requiring employees to create slide decks showing off their X number of projects may make everyone appear like they are performing useful activity, it rarely produces actual results. Human nature usually spoils the advantage of kaizen activity.

However, not all hope is lost. To give up on kaizen methodology simply due to the abysmal failure of the masses is too defeatist. Rather, changes in approach toward the activity can have a dramatic impact on its actual success. Next, you will discover how to approach and apply the methodology in the correct manner.

Continuous improvement or Kaizen activities should always be focused on the following attributes. Every project should be given the green light or the red light predicated upon the following metrics.

The goal and the project should be achievable.

Such an obvious requirement would be universal understood and not required to be stated. I can attest to the fact that it must be stated and examined with every project idea that is

considered. There are many engineers throughout the world right now having to say “NO” to project ideas that are not only not profitable to implement, but they also defy the laws of physics.

The project and its outcome must be able to be measured in terms of profit.

Project ideas must be based upon data. “Here is what we have before the project (show old data), Here is what we now have (show new data). This equates to a savings of (\$) and here is how that dollar figure was calculated.” This is the type of results and findings that should be required of every project. Projects should never be attempted due to feelings or gut intuition. Projects should not be attempted because “other facilities have this thing.” Improvement activity should be approached because the observation of the data makes it obvious that an project would bring about improvement.

The project should be simple, and should tackle low hanging fruit where possible.

Most facilities fail to become more profitable not because they fail to know, rather they fail to do what they know. That is a truism that applies to many aspects of life. Most facilities have an abundance of low hanging fruit that would be perfect feedstock for their continuous improvement “machine”. Nevertheless, many in manufacturing, as in other industries, wish to demonstrate their creativity. When tempted to allow such behavior to flourish, you would do well to remember that no where on a bank deposit slip is a place for one to deposit “creativity.”

The project should be well defined and focused.

One of the largest problems with any project, no matter the industry, is scope creep. It is the fallibility of human nature that we have to fight against all the time. Large projects that cost millions of dollars to implement usually have barriers to such vices, and that barrier is additional costs. Smaller improvement projects do not usually enjoy the same protections, thus they become

more susceptible to the ever present tendency of scope creep. By placing borders and focused definition as to what will and what will not be part of a project, the project team can usually help mitigate the monster.

Sometimes the best way to implement continuous improvement activity is to not utilize an internal team of employees. It may prove wise to bring in an expert for whom such fallibilities have long been purged from their *modus operandi*.

I once heard a story of a Japanese engineer who came to the United States. This engineer spent 6 months at a production facility that was located in the US, but owned by his employer over in Japan. The engineer's task was simple. Take one production line within the target facility and improve it through kaizen activity for the duration of his 6 months stay.

Upon arrival, he made his way to one particular department within the production facility, then he decided upon one production line within that department. His focus was completely dedicated to this one production line, limited by what he could see and collect data on.

This is the nature of how the engineer achieved his kaizen improvements, once all of his initial data had been collected, he identified the low hanging fruit that could be improved upon. He spent zero time at his desk. All of his time was spent watching and recording what was happening on the production line in a certain area. The project cycle usually occurred as follows. After one or two days of watching for a particular problem he would proceed by setting down with the plant manager. He would demand for the machine to be shutdown for the following day and for all of his prescribed changes to be accomplished. It turns out that production schedule did not matter. Orders came directly from Japan that whatever this engineer prescribed was to be done. After the changes were implemented, the engineer would spend another day watching the machine run while recording data about the improvement that the change brought about. If the

change did not give a satisfactory response then the production line would be brought down the following day and more changes would be made. This cycle continued until an identified problem on the production line was improved or eliminated.

The engineer continued to go through that entire production line in that same manner for the entire 6 months. Upon his leaving the facility, that one production line was setting production records.

Notice how the engineer from Japan worked and utilized kaizen activity. There was no huge number of projects. There was no huge team meeting. There was no slide deck. There was no discussion about how everyone felt about what he was doing. Every change was focused. Every change was measurable. Every project was pursued until measurable results were achieved. Every project could produce real change upon completion. Learn from the Japanese engineer. If you do not have the ability to hire an expert to come to your facility, at least try to mimic his methodology.

There is one other aspect of continuous improvement activity that should be considered. That is profitable ideas should be incentivized. Most production workers are at work for one thing and that is money. You may be able to argue that there is other reasons, but stop paying one of them and see what happens. For employees who bring project ideas that are simple, achievable, and profitable, they should be rewarded somehow. Something to consider.

Simplifying

Simplifying the production process can have many advantages to a company's financial position. Recall the lesson learned from Equation 8-1, where it was demonstrated that overall

production line reliability declines as more workstations are added in a series configuration. That reality makes it evident that the goal in any manufacturing process should be simplification.

While that statement is easily made in print, it is much more difficult to facilitate in a business, or on the production floor. Successfully simplify operations requires unbounded creativity, or at least some great ideas that can be borrowed and bent to one's particular situation. Hopefully the subsequent examples can help you consider some of the possibilities that are available to you.

Bob is the owner and operator of a small guitar pedal manufacture company. The name of his company is called "Bad Kitty" (perhaps we have encountered his business before.) For many years, Bob would have his circuit boards made and shipped to his facility. After the boards were received, his employees would then hand wire all of the required components and solder all of the connections. Bob decided one night to conduct some research on ways that he could streamline and reduce some of the work in his facility. He came across a supplier that would be able to take his circuit board design, and manufacture completed circuit boards for his pedals. Bob made the decision to make a trial run with this new supplier, and the experiment proved to be successful. Now, Bob purchases all of the circuit boards pre-made. Once they are received, he simply drops them into the pedals. This act has reduced the amount of stations that he has in his facility. By keeping a large inventory of the premade circuit boards, Bob has increased the overall reliability of the Bad Kitty production line. Bob made a few other smart moves as well. Bob kept all of the old production equipment and workstations that were used to produce the finished circuit boards. Usually, these workstations are never utilized with the exception of R&D, but on the off chance of a shipping or supplier failure, Bob could still be in production.

Then there is Jim. Jim owns a sheet metal shop and produces duct work in addition to other custom designed pieces. Jim produces a certain component for one of his larger industrial customers that requires a repeatable procedure that requires a series of crimps and spot welds. The customer and this particular product make up 60% of Jim's revenue. (Not a great place to be in, but at least the parts are produced on a long-term contract) Jim was visiting a trade show last fall and ran across a piece of equipment that is capable of performing all of the required steps to produce this product at one station. By purchasing said equipment, Jim has more production time available to the shop, and has reduced his labor cost. He is expecting a payback period of 36 months.

Dave is the purchasing manager at a large national manufacture. For many years, Dave was having their sandcast vendor send the raw cast steel parts to one of the company's production facilities. From there, the parts were finished ground and drilled. Dave found two new suppliers that can perform all these functions. This has reduced the number of stations and time on the production line at his facility. Due to the fact he now has redundant suppliers, the production reliability has risen significantly.

Consider John, who is a plant manager at a large rubber floor mat manufacture. John's facility also produces industrial rubber hoses. John used to mix all of his rubber onsite, requiring him to have all of the various chemical inputs to be shipped to his facility and blended together. By working with his in-house chemists, John was able to reduce the number of rubber recipes that his facility utilized from eight down to three. This discovery allowed John to outsource some of his mixing operations.

Perhaps you were able to glean some usable ideas from the proceeding examples. In every business, there is something that can be simplified. If by the process of that

“simplification” increase profits result, then in most instances those simplification activities should be pursued.

There are few particular lessons that should be mined from the proceeding examples. If you will recall the story of Bob over at Bad Kitty. Remember how Bob subcontracted his circuit board production while keeping his old workstation. By keeping the old station, Bob turned one of the work stations in his series configuration, into a parallel system. Look at this example:

Here is sample data on the three workstations in the Bad Kitty production line.

Old Bad Kitty

Station A = 80.0%

Station B = 97.8%

Station C = 94.0 %

Old Total Reliability = 73.55%

Now, by utilizing the sub-contractor for the circuit board production, but simultaneously maintaining the old workstation, a parallel reliability scenario presents itself. That is demonstrated below.

New Bad Kitty

Old Station A = 80.0%

Sub-Contractor = 97.4%

Combined Reliability = Station A* = 99.48%

Following this line of logic, Station A Prime (denoted as Station A*) is to be inserted in place of where Station A used to be. Now the production line looks like this:

New Bad Kitty

Station A* = 99.48%

Station B = 97.8%

Station C = 94.0%

New Total Reliability = 91.45%

It is now obvious that Bad Kitty is performing much better. Their production line reliability has increased by 17.9%. That is worth writing home about. If Bob were to figure at a way to eliminate Station B altogether his production line reliability would increase even more. (It would equate to 93.51%.)

Consider Dave's accomplishments. This savvy purchasing manager was able to replace one supplier with a parallel network of suppliers and eliminate two other workstation altogether. Very impressive.

Simplification of the manufacturing process is the goal.

Station Ergonomics

Often is the case where ergonomic consideration in the workplace is limited to injury investigations or limited job tasks. While both considerations are sometimes necessary, complete station ergonomics should be considered. In same way that employees conduct benchmarking studies, reliability studies, etc. the entire cycle of movement should be study for each workstation. How does the employee interact with the equipment? Where is the natural place for

that button to be placed? Every movement of the employee and their interactions with the equipment and material should be questioned. Each observation should have to be measured against the following question. Is there a way to make this movement easier for the employee and more efficient?

Perhaps you have heard the story of the race car driver who went over every square inch of his car cutting off the long ends of the zip ties. When asked what he was doing, he simply responded “Ounces add up to pounds!”

When management gets serious about conducting such studies, and then acting upon the results, unintended consequences start to occur. The production employee moral will usually rise. “Hey, these guys are no joke and they actually care. I know they are doing it for their own best interest, but it is making my life easier.”

This type of authentic moral boast cannot be purchased. Perhaps you are a smaller manufacture, and you think that such activity can only be reserved for large corporations. I am here to inform you that large corporations may talk about ergonomics, but they fail terribly at the execution. If you operation is small and you competition is large, this is place where you can gain some serious leverage if you put in the effort.

By now, I hope that you are sensing a theme. There is a great deal of time required to study your production line. First, you must study your production line to measure its reliability as a function of down time due to maintenance issues. Next, you must study your production line as it relates to other downtime issues. After that, you then are required to study your production line in order to benchmark your various workstation’s ability to produce work and continue to benchmark on a periodic basis. Then production line studies are required to create and complete

well executed and profitable Kaizen projects. More watching is required to spot opportunities to simplify the production line operation. Finally, production line studies are required in order to make improvements in station ergonomics.

Assuming that the preceding paragraph is true and that all the previously listed study activity should be occurring in every production environment. Then it should also be true that every production floor in the world should have employees with clip boards and stop watches stalking their facility...They don't!

Unless there are significant negative changes occurring in the financial statements or operations reports, these types of production studies will not occur. "If the widget producing box is making profit...why bother." No one wants to say that part out loud, but that is the attitude of many large corporations toward their manufacturing facilities.

If you are an owner or senior executive of a smaller or mid-size company...this is your chance. You may not have large injections of capital or debt that you can use to expand; however, you can do what the big guys won't. You can take your knowledge and make your existing operations into smooth running profit machines. It takes diligence and effort, and you can never let up. Nevertheless, if you take these lessons to the production floor, you will reap what you sow.

Chapter 9 – Quality

Quality! One of the most abused concepts in the modern manufacture space. Everyone has their own personal definition. Everyone has their own ideas and opinions about their own personal definition. Management will use the term “Quality” in vain to facilitate any type of change they desire, even without objective data. Quality has truly turned into a bloated whale that lies on the beach, dead and stinking.

It is a common sight to see management employees going about their day, spouting quality nomenclature and buzz words, without knowing what the terms mean, or where they come from. If that is not bad enough, modern manufacturing has taken ideas of quality metrics and tried to overlay them onto production processes for which they were never intended for. Then senior management, which usually knows even less about quality, stands in applause and encourages more of the same behavior.

The condition of Quality departments in the manufacturing space is truly in disrepair. The fundamental questions are not being asked. Critical thinking is not taking place. Understanding of Statistics is lacking. If I had a nickel for every Six-Sigma Belt project that I witnessed which was implemented incorrectly on a process for which it was not designed for, by someone who did not understand probability density functions. I'd be wealthy!

Given all of the failures surrounding the understanding of Quality in the manufacturing environment, perhaps it is not that important after all? If everyone is failing and businesses are still profitable, then what is the big deal. First, businesses are not profitable. In fact, out 9,600 publicly traded companies that you can run through a stock screener, only 28% will have a positive net income. Second, the fact that anyone in the manufacture space is profitable in light

of the poor understanding of quality is actually a testament to its power and importance. Even though the majority are running their quality departments poorly, even their bad attempts are having positive impacts.

Consider the following stories which demonstrate how important quality truly is in the manufacturing environment.

During calendar year 2023, Ford Motor Company sold a quantity of 750,789 Ford F-series trucks. Consider a scenario where Ford was to have a quality issue affecting only 4% of the trucks that they sold during 2023. That is a reasonable number of vehicles to be affected by a recall. We will also create a cost to repair the recall that is a reasonable figure, say \$1,700.00. Now, this cost to the Ford Motor Company to fix the recall on these 30,031 trucks equates to \$51,052,700.00.

That may not seem like a big deal considering the amount of net income Ford makes in a year. However, you would be surprised. Perhaps you are already aware that automotive manufacturing is capital intensive, and can sometimes bring about lower profit margins than other businesses. Ford Motor Company is not immune to such realities. Their Net Profit Margin for that same year was only 2.467%. Ford's total net income for 2023 was \$4,347,000,000, which means that our little recall on just 4% of their trucks cost the company 1.17% of their entire net income for 2023.

That hurts! Imagine it was not just 4%, but 14%! As you can imagine, quality issues can get very expensive and quickly rob a business of its profits. I can't imagine anyone wanting to be in Boeing's shoes for the past five years. This is to say nothing of the lost revenue

precipitated by bad publicity through media and word of mouth. Brand loyalty is still a major key in purchasing decisions, and once lost, it is hard to regain. Ask Robby Starbuck!

The proceeding example, although fictional, illustrates a very important lesson. Producing quality products without the need to be retouched is vital to ensure that an enterprise remains profitable. If you are a small manufacture who is yet to institute a quality department, or quality check procedures, that needs to be remedied.

One of the easiest ways to increase the production of quality products is production simplicity. The proceeding chapter demonstrated how removing steps and stations from ones manufacturing process could actually increase reliability. That type of idea and attitude also has a positive effect on the quality aspect of finished goods. If you have one production line which requires 27 steps to produce a product, and right beside it, you have another production line that requires only 7 steps to produce a product, which production line will exhibit more opportunity for quality issues to arise? Simplicity is key.

Quality checks should also be made as simple as possible. If your manufacturing process does not lend itself to six sigma, then don't use it. If large statistical data sets will not bring you more profit, abandon them immediately. Keep your metrics simple and become profit focused with your quality checks. After you have implemented quality procedures that work, you can then experiment with using more sophisticated data models for tracking quality from a statistical point of view. This is where common sense must reign supreme.

For those of you that oversee multiple facilities, consider that each facility may be better off utilizing their own quality procedures. If a facility can prove that their simple processes work, then continue those processes, or build upon them. Do not replace them with sophisticated

statistical models that have not been proven profitable for your facilities just because “it’s what the cool kids do.”

One of the first steps in creating a valuable quality department is to determine what about your finished product is critical. For example, Bad Kitty has their guitar pedal boxes premade. Now the overall dimensions on the outside are not a critical measurement; however, the measurements on the inside are. This is because the electronics must fit inside the cavity of the box. Therefore, it is the inside dimensions that should be looked at. Purchasing premade parts like this would be a good example of where statistical methods such as sig sigma could be implemented. However, it would be much easier just to have the boxes oversized to the point that every box purchased would meet the specification, even if it the inside cavity was a little tighter than the tolerance. Always look for a way to “design out” the need for quality checks where you can. Especially in smaller manufacturing environments.

If Bad Kitty was purchasing 1 million premade stomp boxes per year, different methods may be required. Obviously, overbuilding these to a size that ensures plenty of cavity tolerance would still work, but now Bad Kitty is in a situation where the extra weight is a significant contributor to their cost of goods sold. This is where a properly implemented technique such as sig sigma should be utilized.

True Six sigma implementation requires that only 3.4 parts per million do not meet their stated specifications. Think on how that process would have to implemented in Bad Kitty. Large samples of data would have to be collected about the finished size of the internal cavity. Then once enough data had been collected and analyzed, Bad Kitty could reduce the tolerance by a few mm. Then repeat the process. When consider large statistical metrics, high volume is obviously required to make the effort possible, much less profitable.

Process Understanding

Most production processes that require quality measurements should be thought of as follows:

Inputs enter **Process** which produces **Outputs**

The process is controlled by two major categories of influence. These would be Controllable input factors and Uncontrollable input factors. For those readers who are more interested in this topic, works by Douglas C. Montgomery provide great clarity.

Now in the proceeding example where Bad Kitty is ordering parts from another supplier, there is little to no controllable input factors except for the drawings and contract language that is utilized when purchasing the parts. Even if the drawings and contracts are created correctly, there is still little control over the outcome. Just the option to refuse to accept and pay for the boxes if they do not meet their stated specifications.

Here is a thought experiment to help you gain a more clear insight into how quality and the measurement of quality should be approached. Consider a workstation in a production line. Perhaps the inputs consist of a subassembly a resister and some solder. The controllable factors would be the employee, the temperature of the solder iron, the amount of flux used, the size of the resistor, etc. The uncontrollable factors would be the time of day, how many had been produced before (employee fatigue), the humidity at the station, etc.

Every time a station or process is studied for quality purposes, all factors (controllable and uncontrollable) need to be recognized and documented, even if they are not measured. The reason for this is that inevitably when something does go wrong in the future and you investigate

what could have contributed, often the uncontrollable inputs are ignored. A great deal of “tail chasing” usually ensues. Do not place yourself or your employees in that position.

One last topic before leaving this section on Quality. Questions concerning what to do with waste product, or out of spec. product. Waste product can come in the form of waste parts or material generated in the manufacturing process, or it could include finished products that do not meet specifications.

For finished products that do not meet specifications, you may wish to consider a “Seconds Sale.” This is where you collect several out of spec. finished goods, and throughout the year you will occasionally offer these products as steep discounts. Many times, the complete cost of the finished good can be recouped, and perhaps a little profit.

In fact, any amount that you could collect would be welcomed, because the only other alternative is to cannibalize the finished product (which cannot always be done) or throw it away. Depending upon your product, throwing it away may look advantages to you. Perhaps you produce blankets and could give the seconds that you could not sell to the poor for a tax write-off? Maybe, your product could be transformed into something different, a tire swing? Think outside the box and work to get some value out of a product that is otherwise scrape. There are many who do not want their brand associated with subpar products, and that is fine as long you never have any. However, if you are building finished goods that don’t make the grade in high enough quantities (after you have fixed what is causing your quality issues) you need to capitalize on these items the best way you can.

Waste generated during the manufacturing process must also be disposed of. This is where creative thinking must prevail. I have seen countless manufactures just allow this waste to

pile up with the promise that they will “re-process” the waste and utilize it further. The problem usually lies in the fact that their production line cannot “re-process” the waste in amounts high enough to overcome the amount being generated. This in turn leads to valuable floor and storage space being used up.

Perhaps that is another company that could use the product. Perhaps that is a recycling facility that would be willing to accept it. Do not allow your manufacturing operation to be choked with waste on the hopes that you can reprocess it time when you know that you can't.

References:

2023 10-K for Ford Motor company

<https://d18rn0p25nwr6d.cloudfront.net/CIK-0000037996/18354c35-a340-4f1d-9b1a-e8ff0bae917e.pdf>

<https://finance.yahoo.com/news/ford-f-sells-2m-vehicles-183000657.html#:~:text=A%20total%20of%20750%2C789%20customers,up%2013%25%20year%20over%20year.>

<https://media.ford.com/content/dam/fordmedia/North%20America/US/2024/01/04/Q4%202023%20Sales%20Final.pdf>

Chapter 10 – Purchase Orders & Contracts

I first met my mentor Charles in an old telephone service building. The construction company that he owned had purchased the building for its regional operating office and had converted it decently well. Charles was an old master in the MEP construction space, I knew upon the first time meeting him that working for him would be an education for which I would get paid. I was right. There were three major lessons that Charles taught me during my time with his company, one of those lessons I feel obliged to pass onto you now. Charles had a mantra when it came to contract language. “When you think you have found what you are looking for, keep reading!” That advice has proven to be true more times than I can recall. I have been served well every time I remembered those words and penalized many times for ignoring them.

If you have any hopes of operating a successful manufacturing operation, purchase orders and contracts are going to be a critical aspect of your business. Most of the time, money will not move from one account to another without the use of purchase orders and invoices. These exchanges could be for materials and services that you purchase, or for the finished goods that you sell.

There is an old saying that exist in the legal world, he writes the first draft wins. All purchase orders are simply contracts stipulating the nature of the purchase. When possible, you want to make sure that the party that you are conducting business with is adhering to your proposed purchase order that you drafted. The reason for such action is that if you drafted the purchase order, it is most likely “leaning” in your favor. Therefore, it may be wise for you to have two generic templates. One for purchases that you make from others, and another one for

purchases that are made from you. If you don't have a template already, or if you are a smaller manufacture, you can find examples online and use them as a jumping off point.

My suggestion would be to get four or five different examples, pull the best language from each of them and change it to fit your business and make it to where it reflects the way that you want to conduct your business. Have your legal advisor and accountants look over your drafts and make changes as needed. Depending upon your insurance provider, you may be required to operate with purchase orders.

It is common for larger corporations to force all their vendors and suppliers to agree to the corporation's pre-drafted purchase order terms. Their attempt to force the smaller companies into submission is usually successful since these contracts represent such a large portion of revenue for the smaller suppliers. On the off chance that the larger corporation agrees to consider and review the purchase order terms of the suppliers and vendors, these documents usually end up dying in the legal department while the company attorneys take 6 months to pontificate on three sentences that they find "risky."

If you encounter such a situation as this, then simply use your best judgement and accept the "risk" if you can. However, if you find their terms and conditions preposterous, then walk away. Don't let fear keep you from profits, but don't be foolish.

Most purchase orders have only a few goals in mind:

1. They are legal instruments designed to protect one party from liability.
2. They protect the purchaser from the risk of receiving a bad product or service that they have already spent money on.

3. They offer a way to settle disputes if they arise.
4. They describe in detail the scope of the work or product being purchased.
5. They describe the payment terms.

If you see purchase orders that are more involved than that, then you may have reason to be cautious.

Below are some helpful tips when dealing with contracts and purchase order issues.

Use trusted vendors

In previous chapters, finding redundant vendors and suppliers has been encouraged for various reasons. When utilizing a new vendor for the first time, it is usually prudent to prove them by only entrusting smaller purchases with them in the beginning. Trust them with little before trusting them with much. The extra work required to think through and create such scenarios is worth it. Also, be prepared to encounter disappointments. Sadly, the business climate of today is littered with the amateur rather than being full of professionals.

Utilizing trusted vendors can often lead to long term business relationships. Perhaps you have heard about or witnessed business relationships that have lasted over 30 years. Usually disagreements or problems do not require legal action, but rather are simply solved over lunch and a handshake. Obviously purchase orders and contracts should always be utilized, but conducting transactions with people that you still want to be doing business with 20 to 30 years from now should be one of your goals.

If you must give, be sure to get

If you ever find yourself in the position of negotiating contract language with a larger company, then you may end up having to yield to their purchase order language and terms. They usually win through positioning and delay. However, that does not mean that you just have to eat everything that they serve to you. Every corporation that is large has a legal department that reviews purchase order language exceptions. When enter negotiations with these departments, you should always ask for more than what you want and expect. You will be met with a wall of resistance. That is to be expected.

That is where you pull out your special phrase. When the larger company proposes that something go in their favor, you need to respond by saying “I understand, but what can you give me in return that would make it more fair for my position?” Allow them to “give up” some of their language and demands, and let them chose what that is. Believe it or not, most large corporate legal departments have to yield to companies that are even larger than them. There is always language within their purchase order that they are willing to “give up” and they know what they have “given up” in the past. You may never find their offerings beneficial to you, and that is okay. However, if you are going to have to yield, get some candy for doing so. Not being a pushover will place you in a better position in the long run.

Simple language is best

As you become more familiar with purchase order and contract language, you may begin to notice some common themes. These themes are often what is referred to a “Boiler Plate” language, and sometimes can be written in very legal style language. When at all possible, stay with simple language. This is especially true when dealing with smaller companies or with organizations that may not utilize purchase orders a great deal. If you present to them a purchase

order template that is 4 pages long, has 28 points along with some Latin terms thrown in....they are not going to respond. Keep your contract language as simple as you can whenever you can.

Find out where your customer is flexible

In the same manner that you desire to enter in to contracts with favorable terms with larger companies, smaller companies will also desire to enter into favorable contracts with you. No one wants to be taken advantage of. Remain flexible where you can, but do not give away the farm. Treat the smaller company fair, but be sure to make “exchanges” and not concessions. Remember, your first duty is to your company and its wellbeing.

Push terms everywhere you can

Over the past decade, it has become common for large corporations to request longer payment terms from their vendors. What used to be the customary Net 30 invoice can often now be seen printed with Net 90, or even Net 120. I personally find the practice wrong; however, since the rules have changed, smaller companies must change their strategy as well. You may be asking, “Why are these large corporations requesting such large extensions on their payments?”

That answer can be complicated and multifaceted. Essentially, you might compare it to a bank draw that a general contractor would receive when building a home. The goal of the GC is to always build the house with the “customer’s” money.

Consider this example. You invoice our favorite company (Bad Kitty) for \$10,000 utilizing Net 30 terms. Given your savvy business experience, you even offer a 1% discount for funds received 15 days after receipt of the invoice. Bad Kitty looks at your 1% discount and laughs at it. They have now requested Net 60 terms to which you agree. Now look at what Bad Kitty is about to do with that extra time.

With those 60 days, all sort of options to make extra money open up. Bad Kitty is going to take that \$10,000 that they owe you and purchase a US Treasury 3-month T Bill (at 5.4% annually return). For that T Bill purchase, they will receive 1.35% return. When the 60 days is up, they will simply pay you with a cash back credit card realizing a 2% savings...which they will pay back with the redeemed T Bill 30 days later with no credit card interest penalty.

By you simply agreeing to Net 60 instead of Net 30, you allowed Bad Kitty to pay their invoice at a 3.35% discount...yet you thought that 1% Net 15 was enticing. Consider the large corporation who has monthly expenditures totaling \$85,000,000. Under such a scenario they would be able to save an extra \$2,847,500 per month. Can you imagine what the large corporations are able to do with the Net 120 terms? In the proceeding example, a US T Bill was used, but it could be any investment opportunity that was liquid and provide a high enough yield.

Perhaps you were able to learn some insightful lessons from the proceeding fictional example. It may be that your business does brings in less revenue and is blessed with smaller monthly expenditures than large corporations. Nevertheless, their practices should be your practices. If you were to reduce your monthly expenditures by 3% over a period of three years, would that have a significant impact on your business?

Once a year, you should contact everyone that you make retinue purchases from and ask for longer terms, or more favorable discounts for paying within the existing term limits. Not everyone that you contact will agree, and some who do will simply offset their costs to you via the amount of the discount just to appease your request. However, there will be some vendors who will simply comply, and the groups corporation over time will make an impact on your financial condition. Do not make a habit of leaving money on the table.

The same exercise should be made with everyone who owes you money on a periodic basis. You should always be seeking more favorable terms for your company. Perhaps your business is seasonal and faster cashflow would benefit your operations. Perhaps you may be able to improve some terms by just ten or fifteen days. Always be asking. If you ask enough, someone will say yes.

Most small businesses do not consider themselves in need of treasury operations. However, holding liquid cash in T-Bills is a wise activity. Most investment brokers, or your local bank can assist small businesses with these efforts. Do not utilize money market funds as a way to gain interest on your cash. These money market funds have special provisions that allow the bank to seize the funds within them in case of a financial or liquidity crisis. This is due in part to federal legislation that was passed after the GFC of 2007-2010.

Get that downpayment

As alluded to previously, the construction industry possesses a unique style of cashflow management. That is why the industry is so enticing. Contractors are usually allowed to work on projects that are tens of times the cost of their company's cash reserves. This fact alone allows for large amounts of leverage. In addition, most contractors are allowed to submit a "schedule of values" which declares the frequency and amount of future payments. Most contractors will front load these payments to ensure advanced cashflow ahead of their due expenses. This allows them to build their clients' projects with their client's money.

This behavior can be very instructive to other business models. The more payment that a business can receive on the front of a transaction, the better. Some companies manufacture or sell simple widgets and cannot take advantage of such a model easily. Nevertheless, there are

plenty of other businesses who can and should. If you ever are given the opportunity to build your payment terms to your business in such a way to receive more money upfront, you should do so.

Adjust your price

There are two aspects to price elasticity that most manufactures need to be aware of. First, when dealing with large corporations that are equipped with purchasing agents. If you ever find yourself in a position of selling to such a corporation, rest assured that you will have purchasing agents who will ask you to lower your price whenever a price is submitted. The savvy manufacture and business owner should always expect this and adjust their price accordingly before submitting their proposals to purchasing agents.

In like fashion, your suppliers and vendors are most likely expected to get “beat down” on price by you. Your company must consider this and ask for discounts from your suppliers accordingly.

The other aspect of price elasticity that needs to be considered is that there is a significant probability you are pricing your wares or services too low. A business should always price their product, even a commoditized product, based upon its true value to the market and not what the “market will bare.” If a company is unwilling and unable to increase the price of their goods or services, it is usually due to a quality issue or a lack of correct marketing.

Know your contracts

If 100 business men were to be quizzed about the terms and conditions written within the contracts that their business are involved in, almost all would fail miserably. This is a significant problem. Even if you must agree to a purchase order drafted by another party, you still have

stipulated rights within that agreement which you may wish to take advantage of, or may need to threaten to take advantage of. Too often, these terms and conditions are only consulted when something goes terribly wrong. Do not be afraid or timid when it comes to exercising purchase order language...that is why it is there. Take the following conversation as an example:

“Bill, I must have that shipment FBO by Friday of next week. Now this has been the third delay this month. I don’t know if you know this or not, but that PO that we have with you gives me financial recourse with your company. I have worked with you for over 6 years now, please don’t make us use that clause in the PO. We don’t want to do that!

“I understand Dave. Let me move some stuff around and see what I can do. Call me back in two days and I will tell you where we are it.”

Bill responds “Thanks Dave!”

Not every confrontation has to get hateful or lead to arbitration. Sometimes gentle reminders can work wonders when it comes to contract language. If you wish for such conversations to be effective, it is best to have these conversations early before situations become dire.

Not only is it important that management know the language present in such contracts, but every employee that interacts within the physical aspect of the contract execution should know the language that is present within the contracts that govern their activities. This may include stock boys, operators, schedulers, etc. Employees need to know that their tasks are important and why.

Change orders

There are some business models which extract significant amounts of profit via change orders. That is usually a difficult way to stay profitable due the fact that those who “Live by the sword die by the sword.” When utilizing companies that operate in such a manner, it is wise to ensure that your scope of work or other contract language is as complete as possible, utilizing all of the applicable language that you can think of. Be sure to include language that works in your favor. Change orders which occur that are of no cost to you, means that the change order went to the benefit of your service or parts supplier that you are purchasing from. You should feel no guilt for trying to negotiate change order pricing. There is profit, plus fat in those change orders, so be sure to be a good cook and render the fat.

Chapter 11 – Key Performance Indicators

KPIs are great tools if used correctly. Here is a secret. KPIs are almost never used correctly. The main issue that arises from KPIs is their unintended consequences. This is always the result of a poor KPI creation process. Typical problems with most KPIs include:

1. Failure to be transparent about the hierarchy of goals and objectives.
2. KPIs in different departments that specifically work against each other.

Reflect upon the age-old example of engineers being incentivized by their KPIs to keep the storeroom stocked with equipment parts while Finance KPIs are to lower overall storeroom cost. Departments end up pulling the same rope in different directions instead of pulling in the same direction. Physics is simple. When everyone pulls in different directions, the rope does not move.

KPIs should not change due to new fads or management winds. The goals and objectives of KPIs should be classic. Once set, if they are truly good and well thought out, they will only require “tweaking” as the business environment changes, not overhauled and revamped.

KPIs are not a tool for ambition. Those wanting increasing roles of responsibility and attain more salary should not look upon these KPIs as exams to be passed to get on the next rung of the corporate ladder. Employees and managers using these tools wrongly is what leads to the abuse they receive.

KPIs need to be developed in two directions. Top down and bottom up.

The role of the CEO and the Board of Directors is to establish the long-term vision for the company. How much revenue should the company take in per year 30 years from now. What sort of industries will the company be involved in. etc. These types of questions should be considered and answered in the C suite. These are the leaders, and they should have a destination to lead their employees too. Their vision should be clear, written in simple language, hiding nothing. Too often, boards will publish statements written in such watery anemic corporate speak. They end up truly saying nothing...which for most companies is the goal. They accomplish their goal well.

Once this vision is created and agreed upon, it needs to be shared with the employees. Every employee, even down to the janitor that cleans the floor on night shift should be aware of the destination that the company is aiming for. Each employee should know what their company does, what it wants to do, and that there is a plan to grow and go somewhere. If western literary cannon has taught us nothing else, it has at least taught us that men crave adventure. Give the vision to all the sailors freely. Let them know that the company is going to sail halfway around the world and siege that great walled city for the next 9 years! The correct people will board the ship, and the wrong people will get off at the nearest port.

A company would be ready to create timeless KPIs only after they had accomplished the above objectives. These KPIs should be classic and powerful enough that they should be able guide the company for the next few decades. Here is a question that is worth asking, how many KPIs should a person be responsible for? No more than three or four at the most. If you will recall, Christ summed up the entire Old Testament law and the message of the prophets in just two commandments. I seriously doubt that any company is so complex that more than three or four KPIs are required for its employees to excel in their mission.

KPIs are a measurement tool. As such, they function in a multifaceted way. The primary objective of a KPI is to give managers a way to measure performance of an employee or group measured against the goals and objectives of that employee or group. Since these are actual metrics by which one human measure one another, the very nature of KPIs entices people to engage in certain behavior, some of which is selfish in nature. These facts must be understood.

There is a concept that should be introduced before describing the proper methodology for creating KPIs within your organization. That is the concept of abuse testing. This idea is the peer review of a KPI by another employee or group in order to determine how the KPI might be gamed, why it might be gamed, and what the negative outcomes may be as it relates to the long-term objectives of the company.

Abuse testing should begin in the C Suite. Each stated KPI and agreed upon goal at this level of management should be peer reviewed. Each objective should be examined in light of how human nature may be tempted via performance metrics to shortchange long term goals for short term success. If an individual is unable to write a short essay about how the KPI that they are responsible for helps their organization achieve the company's stated long-term goals, then there is a major problem. This level of examination should be repeated at every level of the company.

Chapter 12 – Meetings, ESH, and Other Thoughts

Meetings.

Where to begin? Most organizations suffer greatly from conducting too many meetings. This stems mostly from the frailty of human nature. Here is just a sample of reasons as to why the meeting culture has grown to be so prevalent in the modern workplace.

1. Mistrust of lower managers and employees. This often leads to indecision. Workers feel that the only safe way to “make a decision” is to do so in a group or have someone else make it for them.
2. Laziness of managers to properly teach and delegate responsibility to employees.
3. Team culture.
4. The dodging of actual work.
5. Lack of knowledge. This requires employees to extract needed information from others.
6. Hiring the wrong people for the wrong positions.
7. No meeting guidelines.
8. Etc.

Obviously that list could be much longer, but it proves the point. There is something terrible wrong in the modern workplace when 80% of a mid-level managers work day is spent in meetings. Who is running the show? The meeting culture has become so absurd that some CEOs are finally starting to take notice and are pushing back on the advance of the enemy.

One of the negative consequences of this “meeting culture” is the need for more and more reporting. Since managers are no longer able to “manage” (due to their involvement in

meetings) departments are now requiring more reporting to operate. “More reporting, more data, more visibility will save us all!” A very dangerous and foolish idea. What’s more is that such behavior usually begats more meetings, compounding the problem. Most companies do not suffer from a lack of more reports and projections, but rather an unwillingness to issue termination papers. Managers should be trusted and should be present on the floor.

If you are an owner or manager, how should you go about pushing against meeting culture? If you are an employee, what can you do? Below I have outlaid a few guidelines of my own and a few that are barrowed for you to consider.

1. NO meeting is allowed to be held without an agenda first. A proper meeting agenda will include the people that are invited, an objective or background discussing the purpose of the meeting. A time schedule by the minute of what is to be covered, and a deliverables section as to what needs to be accomplished and the decisions that need to be made along with suggested decision options.
2. If you or anyone invited is going to speak less than 15% of the meeting, do not attend, rather have the recorded meeting notes sent to you in an email.
3. Each meeting should have a “Salary Counter Clock” displayed at all times. This will not be the combined gross salary (plus benefits) of the employees in attendance. If you have 12 people making a salary of \$100,000 a year, that will cost the company around \$147,000.00 a year. For a thirty-minute meeting of those 12 people, it is costing the company \$450.00. Employees need to see that cost rise by the minute live during their meeting. There is already software available that does this, or you can build your own. Your employees need to know that

these meetings are not free, and they need be extracting \$450.00 worth of value out of that meeting.

4. No meeting is to be held without a facilitator and each meeting is to have the meeting minutes recorded. It is the job of the facilitator to keep the meeting on track with the proposed agenda, interrupt people if needed, and stop the meeting if it is unproductive or if people are unprepared. The recorder should obviously record the meeting minutes. These can be audio recordings with transcripts that are made into searchable .pdf or .doc files.

5. Keep the number of attendees to less than ten people.

6. Stop using slide decks and switch over to memos. Amazon has both 1 page and 6 page formats. Adapt one of these or utilize a military style memo format. If your facilitator can not effectively summarize the reason for the meeting in a memo, they have no business holding a meeting.

7. Send the memo communications ahead of time and before the meeting. At Amazon they spend the first few minutes of the meeting reading the memo. This is not suggested. If you have meeting attendees that come to a meeting unprepared, that requires a “do better” discussion from their direct manager.

When it comes to reporting, I often have a simple rule. For every new report that is required, two other reports must be removed. That does not mean that management is allowed to just combine two reports into one. What it does mean is that management needs to be deliberate about what information should be included in their requested reports. Metrics should be carefully chosen. Frequency of reporting should be thought through. Subordinates and front-line crew leaders are too often overburdened due to upper management’s reporting demands.

If managers spent more time with their employees, less reporting would be required. Most managers do not require more visibility rather they simply need to demonstrate better leadership among their employees. One reason that corporate America is full of report culture is because of our collective unwillingness to accept that people are either natural born leaders, or they are not. Leadership cannot be taught.

Have you ever considered how many reports that your business generates? Accounting statements for tax purposes, OSHA 300 logs, NPDES, Title V, EEO, State annual reports, etc. That is just touching on some of the mandatory reports that you must file for federal and state agencies. If you have shareholders, the reporting burden becomes even heavier. With all this mandated reporting, why would you as an owner or manager want to increase the amount of time wasted on one more single report for internal metrics? That is precious time that could be used to expand the business, conduct studies on efficiency of your production line, improvement activities, etc.

Purveyors and sellers of technology often tout its ability to increase “efficiency” through the creation of automated reporting. These sellers are not selling the technology but rather the idea that management can continue to be tied up in their endless cycle of profitless activities, while their employees can simply interact with automated software. Sais software will then act as the “manager” and provide the company or business with all of the reporting and visibility that is required to make great business decisions.

It is a great marketing tactic, and in some cases useful. However, in most cases these technologies do not deliver what is promised. It is common for employees to have to change and bend their processes just to interact with these technologies...which wastes valuable time. As stated previously in earlier chapters, do not simply purchase technology for technology's sake.

Do you need a CRM, or would a tickler file work better? Have you thought of voice memos? A white board? Get your employees out of meetings, and away from filling out useless reports and slide decks.

News flash, your company cannot sell one single slide deck, meeting, or a report....so why are your producing so many? Stop!

Environmental, Safety, and Health

I have yet to meet an individual that is excited about a job that is solely based around adhering to government regulations.

Environmental, safety, and health are all ideas that very few owners or manager are against. There is no one who really wants their rivers to become polluted or their employees to get injured. Yet few companies truly wish to take the lead regarding the creation of practices and programs to champion ESH. Most companies simply wish to comply with mandated regulations, in essence trusting the government to look out for their own employees, and their community. Is that really a wise decision? Do you trust the government with anything else?

Safety & Health

Many companies attest to promoting a “safety first” culture, all the while they are really adhering to a “liability first” culture. Managers and owners wrongly think that there is no difference between those two paradigms. Since the creation of workers compensation laws and federal OSHA standards, many managers have concluded that simple compliance with regulations will shed their company of liability, which in turn will keep workers safe.

That idea is categorially false. “Lability first” does not equate to “Safety first” and it is high time that we start recognizing that reality.

I have borne witness to corporate meetings concerning safety accidents in the workplace. Many times, the corporate attorney was consulted more often, and his opinion was given more weight than they of the front-line managers. This is even though that attorney never stepped foot on the factory floor. Common sense is not consulted. Unique situations are not considered.

“Should that man have a harness on while climbing the ladder, with nothing to tie off too?” “Yes!” responds the meeting participant who has never seen the location in question, nor held a tool while on a ladder. Another man exclaims in a meeting “Ground everything” not considering the lighting rod that was just created causes a bigger risk. “Over course it is a confined space!” When there is visibly no danger and or atmosphere issues and doesn’t even meet the OSHA definition.

Fear of liability has taken over the safety departments of America to such a degree that the true mandate of keeping employees safe has been lost. Businesses make decisions that are not financially sound in order to avoid the thought of lawsuits. Companies will often enact countermeasures that cost more than what a wrongful death suit judgement would cost. It is truly reaching peak ridiculousness...I hope this is the peak.

If you are a business owner or a manager and you see policies and procedures being implemented that fly in the face of common sense, then speak up. Do not be embarrassed and do not keep silent. Do not be afraid to tell the OSHA inspector he is wrong or tell the safety manager that he has lost his mind. If a dumb idea is presented concerning a safety policy, call it out for what it is...dumb.

Another aspect of modern safety culture that needs to be remedied is the idea of the countermeasure. Not every incident needs a countermeasure. If someone has a recordable injury because they reached around and flushed the toilet, (I witnessed this report...not making it up) then do not be so stupid as to think that you are going to countermeasure that from happening again. Please, just stop!

If common sense and wisdom cries in the streets and says “Hey you! There is an obvious solution and countermeasure for you to keep this from occurring again. Plus, it wouldn’t cause any problems if it were implemented.” Then you should countermeasure the event. Short of that...your poorly thought out, knee jerk, reactionary countermeasures are not solving any problems.

Place the safety of your employees as the priority over your own liability. When addressing your employees about new safety driven practices that you are going to implement, be honest. Tell your employees that you are doing this to reduce liability and keep them safer. It enrages employees when businesses pretend as though liability has no weight in their decisions concerning safety policy. Working men do not tolerate dishonest men well. Every time you ignore or lie about the fact that you are implementing a practice or policy to protect your own butt, your relationship with your employees is damaged. Tell them the truth, they will understand.

Most employees understand that you have big boy problems, and you need to make a profit for them to stay employed. If you start being really honest with your employees in this manner, your trust bank is going to fill up. You will also get compliance with your policies even if your employees don’t agree with them.

Environmental

Environmental matters can be a drain on a business's time and other resources, but for the most part, compliance is rather straight forward. As long as fees are paid on time, and reports are sent in on a timely manner, environmental compliance is really not that difficult in most instances. It is important to cultivate good relationships with your counterparts in all of the various state and federal agencies that you must interact with. Sending emails, formal letters, and phone calls are a great way to keep in touch. Realize that most of these government agencies are completely understaffed, and the more of their work that you can do for them, the better you off you are.

For example. Say you were to have a question concerning a specific issue regarding a species of bat on your property. You are considering a building expansion but require your state's department of fish and wildlife to issue you a letter of clearance.

You might consider pulling up an old letter of clearance that you received from them in the past, and creating a draft of the letter that you are requesting. Sending that as an electronic file along with your correspondence. If your contact agrees with your case, the easiest thing for them to do is to copy and paste your words, affix their signature, and mail you the letter. Make it easy for the environmental agencies to say "Yes."

The environmental arena is not a space where everyone walks around in fear. Questions of ambiguity are few and can usually be addressed with the aid of some thoughtful correspondence. Businesses that stay in contact with their environmental agencies, and attempt compliance can usually receive a great deal of patience and leniency in the case of a future problem. Make the attempt and reap the benefits.

Chapter 13 – Distribution, Sales, and Marketing

How a manufacture markets its products is usually a result of the type of distribution that is being utilized. Since there are different options of distribution, and the opportunity to use various forms, it is often prudent to evaluate each type in light of their advantages and disadvantages. One chapter is not sufficient to cover the topic of distribution, so any interested readers should feel encouraged to conduct more study on the topic. Nevertheless, the following is a basic list of the types of distribution available to the modern manufacture.

Third party warehouse with shipping to end user

The title itself is rather self-explanatory, but essentially, this arrangement requires that manufactures build a sufficient amount of product, and then pay a third-party warehouse to store the finished goods. When orders come in from the end users or consumers, these third-party warehouses act as fulfillment centers. Their employees will retrieve the product for the order from their warehouse, box it up, attach the shipping label to the box and await pickup by a selected carrier.

This arrangement can work very well for products that are being sold directly to the end consumer. By storing the finished goods offsite, the manufacturing facility can utilize more room for production. As finished good warehouse needs increase, the additional square footage is easily attainable. In addition, these warehouses can be utilized in various parts of the country. Employee overhead for the warehouse workers is covered in the cost of the service.

Very heavy items, such an arrangement may prove more profitable. Transporting bulk product to a strategically placed warehouse closer to one's consumers can drive down shipping cost to them, allowing for higher prices to be placed on the product being sold.

There is the obvious fact that the manufacture will be giving up some percentage of their profit to the third party warehouse, but the flexibility and advantages that such an arrangement offers are often worth the lost profit percentage.

Own warehouse to end user

This arrangement is one of the least costly, but it places additional burdens on the business. Distribution and logistics is essentially its own industry, and by utilizing your own warehouse space for shipping to the end user, you are entering into that business in addition to the manufacturing business that you are already in. Warehouse space is finite and will not be able to be expanded without the investment of additional capital. Additional compliance and regulation will become a burden.

There are positive aspects to this arrangement. One being that the manufacture will be able to exact more control on the distribution and shipping of their product. There will also be write offs for depreciation that the business will be able to utilize to reduce tax burdens which would not be available in a third-party configuration.

Sell to wholesaler or retailer

This type distribution is a great option as long as it remains profitable. Since every entity in the supply chain requires profit when sold to the next business, the manufacture usually sells their goods at a lower price than they otherwise could to the consumer directly. However, selling one large shipment to someone else's location and being done with the sales cycle has huge

advantages. It increases volume, reduces warehouse space requirements, creates less invoicing and revenue management burdens. If the model can be sustained profitable, it should be pursued in most instances.

Often the smaller manufacture resists this idea. The thought of giving up so much profit margin is difficult. For those that find difficulty accepting this idea, consider this. Every large manufacture in the world utilizes this model for a reason, and they are not in the business of leaving money on the table. If you were to set down and actually do the math, you may find that this type of distribution is actually the most profitable. Sure, you may lose 50% profit per widget, but you may sell 200 times as many widgets.

Sales teams

There are usually two types of sales teams available to the manufacture. These are categorized as internal sales teams and external sales teams. The internal sales teams are employed by the manufacture to sell their products directly to other businesses or consumers. Often these clients may consist of wholesale distributors, resellers, etc. External sales teams may consist of businesses who operate as resellers of purchased product, or as independent sales representatives. Two of the more common arrangements used by the manufacturing industry are internal sales teams or independent sales representatives.

The independent sales representative

One can think of the independent sales representative as mercenary. They typically work only on a commission basis. This creates strong motivation. While some manufactures have specific programs and territories in which they obtain independent salespeople, many do not

have a formal process. It is common for the independent sales rep. to contact a target manufacture and structure his own commission deal.

One of the great advantages of utilizing independent sales representatives is the fact that they can be located in far remote locations from the manufacture. This allows the manufacture to have their products introduced to many potential clients in a one-on-one situation which would otherwise not be possible. In addition, utilizing these sales reps multiplies the size the sales team without any additional fixed cost. Since they only work on commission, the amount of sales is dictates the outflows of commissions. Also, these guys and gals have something that can not be taught...tenacity.

One of the largest advantages of utilizing independent sales reps is their customer and prospect lists. Due to the fact that these salespeople work only on commission, they will often represent more than one manufacture or product, thus creating a larger client and prospect list than would otherwise be available to an internal sales team. When a manufacture is able to have their products cross sold to other lists for zero cost their sales and market expense required for customer acquisition plummets. It is a huge advantage that cannot be overlooked.

On the other hand, these advantages can also come with labilities if not handled carefully. Due to the fact that the sales representatives are independent, there is usually no consistent sales or product training being used. This may negatively impact the image and brand of the manufacture if the sales activity if the independent agents is not monitored. A related point stems from the fact that these salespeople work only on a commission basis. This payment structure can yield unethical behavior if not carefully guarded against.

The internal sales team

The internal sales team can be extremely powerful if utilized correctly. Sadly this is rarely the case. Before diving into the most common problems and their possible solutions as they relate to the internal sales force, it will be prudent to consider the many advantages to utilizing an internal sales team.

The largest advantage that an internal sales force offers the manufacture is control. With an internal sales team, the sales process, the prospect lists, the message can all be controlled and monitored for consistency, adherence, and effectiveness. This is a very important point. The preceding statement is only true if the business actually controls and monitors the sales process, the prospect lists, and the message.

Sales training is much too large of a topic to be covered here, but there are a few topics of note that should be realized. First, sales teams need training....but not everyone.

I recently heard a story about a sales trainer where there was a conference room of sales managers. The trainer walked in and handed a book of matches to one of the attendees. The trainer then proceeded to stand on top of the conference table, unzip his pants, and urinate all over the table. When he had concluded his visual presentation, he concluded with the following statement. "Take the best of your sales force and heavily invest in them with training to build their skills. If they have a fire, pour gasoline on it, and throw a lite match into it. Then pi** on everyone else."

A presentation that no one soon forgot. There is object lesson in that story. The trainer was correct. Most sales teams could easily be reduced by firing the bottom 1/3 and then simply investing in everyone else. Training, practice, and skill building cannot be overlooked and must be performed with every sales team.

There is one area in which almost all sales teams can improve upon, and that is follow-up. Almost every sales training on the market presents the concept of follow-up and the statistics on how important it is to securing sales...yet no one seems to listen. Many manufactures do not suffer from a never ending well of potential clients, thus follow-up becomes even more important. Be certain that your internal sales team has a formal and structured follow-up process that is followed without exceptions. Sell until they buy or die!

Joint Venture sales forces

One way to reach other markets and utilize the sales process of other business is the use of joint venture partnerships. This idea is not new, but it certainly is not used as often as it should. No matter what business a person may be in, there is some other business that is complementary to it. By partnering with such businesses, one may sell their product to their client list, for nothing more than a small percentage of each sell. This allows the original business or manufacture to take advantage of other's work. It is an idea that expand as much as one's creativity allows.

Marketing

This section within this chapter is the most important information that this entire book contains. Any business that exists who does not have the ability to attract buyers will find itself out of business in short order. Be able to sell one's product or service is a requirement, and that action cannot occur without a market.

Most people have a very distorted definition of marketing. That is understandable. Most of Western society is absolutely saturated with advertisements. Attention has become the most important form of currency, and it is in limited supply.

Marketing is not simply the act of buying time for a radio spot, or running a paid ad on the internet, purchasing ad space in a magazine. It is much more than that. However, it would be difficult to grasp that concept given the advertisements that are typically seen in today's marketplace. Most advertisements fall into two categories.

The first class of ads can simply be attributed the vanity of the advertisement agencies producing them. Most larger companies utilize the "professionals" to create advertisements and campaigns to capture market share. These types of arrangements usually prove fruitless. Perhaps you have witnessed it. Have you ever watched a TV commercial where you found yourself wondering, "What was that ad for again?" The reason that occurred is because the employees at the ad agency contracted to create that advertisement were more concerned with displaying their "creativity" rather than capturing the largest market they possibly could for their client.

Their client (the business who hired them to create the ad) carries just as much blame. They show themselves willing to purchase advertisements with not accountability to ROI. Such action is akin to the small business owner hiring his daughter's college roommate to become his "social media manager."

"Look Mr. Scott, we 5,000 likes and 13,000 impressions this month!"

No one cares. Groceries cannot be purchased with "Likes" or "Impressions." There is only one true metric to which all advertisements in all media types is to be measured. Dollars!

There is the second class of advertisement that is also commonly witnessed. That is the complacent ad placements shown in the yellow pages or the newspaper. Most businesses feel as though they should be engaged in advertising. Thus, they call the local newspaper and ask to place an ad like all of their competitors do. When asked by the newspaper ad salesman if the

business has an ad already done, or would they like to utilize the newspaper's in house design team to make one for them...guess which one is usually selected. This is the reason that the Sunday newspaper is littered with 12 different HVAC company advertisements, all looking vaguely the same.

Both classes of ads are wastes of investment. Anyone who can accept that a buyer is essential for the existence of any business then must conclude that marketing is the most important aspect of every business. If you are convinced of that truth, then why would you ever allow your budget for marketing to be spent in ways that are not accountable? Utilizing messages and media that cannot be monitored. Shouldn't this aspect of your business be trackable in terms of revenue and profit generated per advertising dollar spent?

As a manufacture, you may be less concerned with marketing. Your situation may be that you produce a product which is only purchased by a handful of wholesalers, thus, marketing does not apply to you. You are wrong. Marketing may be your only way of surviving in case of economic changes. Think about the GFC of 2007- 2010, did any wholesalers go out of business? Remember Covid? Did your business have to adapt? Did you have to discover new markets? If you weren't in business back then, would your current enterprise survive such an event without you needing to adapt to selling to new markets? Everyone, no matter what their place in the economy needs to posses an advance understanding of marketing in order to survive and become successful.

With that small primer out of the way, it would be best to learn some of the correct ways to think about marketing. This small section does not offer enough space to cove this topic sufficiently, so in the proceeding text you will be directed to resources in case you wish to learn more.

The correct way to think about Marketing is this. Marketing is salesmanship multiplied. A famous quote attributed to one of the greatest direct response marketers of all time. Many of the products that you are familiar with today are a direct result of his work.

The first step in marketing is to find your ideal market. Who is it that needs or wants your product. Create a sketch of that person or business. How much income do they make per year? What line of business are they in? Where are they located. The more precise that you can become, the better off you will be in your search for prospects.

Prospecting is an activity that is usually reserved for sales teams. Many sales training products will teach this methodology. When an enterprise is in its infancy, prospect by the lead salesman is usually required. However, as the business becomes established the activity of prospect should fall to the marketing activity. In other words, the businesses marketing activity should be bringing about the warm leads ready to buy, while the salesman closes the sale. Have you ever seen brain surgeons answering phones at the nurse's station between operations? Trained and skilled salespeople need to be about the activity of selling while marketing activity needs to be responsible for driving prospects and leads.

Marketing to a warm prospect list, brought to your company through marketing efforts, is a great deal easier market to than a cold prospect lists. Both trees yield fruit, it's just that one tree is better pruned and consequently easier to pick from. In both instances, marketing messages should be carefully crafted based on the specifics of the group being targeted (more on this later.) Driving the right message is critical and can increase sales by percentage points. Prospect lists should also be contact via various types of media, multiple times. Recall the passage about follow through. Most marketing fails to yield great results because the efforts are abandoned after one or two attempts. Once again. Sell until they buy, or they die.

Arguably the best type of marketing that any business can engage in is direct response marketing. It is a class of marketing that was birthed from the mail order era of the early 1900s. The reason for its superiority is that it demands accountability. Direct response requires that an offer is always made to the recipient of the advertisement, and a response is always requested utilizing some identifier or marker. This identifier could come in the form of a coupon code or a request for information unique to the ad offer, etc. By utilizing this form of marketing, businesses are able to measure the number of responses that are generated by their advertisement dollars. Profit per ad spend becomes a trackable metric, one that can be improved with adjustments to the type of media being used, a change in message, or the market (demographic) that it is targeted.

By utilizing direct response marketing, businesses are able to track and account for aspects of the ad spend as well. Perhaps a manufacture wishes to understand what the lifetime customer value is for a customer. Then the manufacture may learn that they could spend a great deal more in order to attract the “right” customer than they originally thought. Such realizations may change their marketing campaigns entirely. These types of decisions are only available to the direct response marketer.

If you find yourself in need of assistance with creating the correct message (better known as copy) for your advertisements or need help understanding the best way to market your business, please visit measurableadvertising.com and book a no obligation 20 Minute consulting call for free. Perhaps I can assist you in those efforts. Obviously, I am also available if you require assistance or consulting concerning your manufacturing environment as well. Simply book that same type call so that I can become familiar with you issue and can understand if I might be able to help.

Chapter 14 - Conclusion and Closing Thoughts

I trust that this work has helped you. Manufacturing is important. Back in the 1980s and 1990s, America forgot how important and subsequently, lost a great deal of our manufacturing as a result. To survive and thrive in a manufacturing business in today's business climate, you have to be smarter than the subscription-based business model, you have to be leaner than the software business, you have to be more innovative than the fintech company launching their third app this year. Manufacturing is not for the weak, or the faint hearted. You must be willing to work when others do not. You must do what others won't. You must compete on a world stage and not just a national level. Everyone and every business are your competition. You must seek advantages in unusually places. Be bold and grab the lion by the main.