



ELEKTROWERKZEUG

CONSULTING THAT BRINGS SUCCESS

OPERATIONS MANAGEMENT

SUPPLY CHAIN MANAGEMENT

JCT: Task 3

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Supply chain strategies like vertical integration, keiretsu networking, joint ventures and virtual companies can all be very successful. However, the success of the supply chain strategy relies on the company structure, location, financial stability and management expertise. Start up companies are especially vulnerable to poor supply chain management decisions and should seek to keep their costs low and operations lean as to avoid any loss in sales due to financial stress (see “figure 1” for supply chain strength and weakness comparison).

Supply Chain Strategies				
Strategy	Definition	Strength	Weakness	Use (Y/N)
Keiretsu Network	"A Japanese term that describes suppliers who become part of a company coalition."	Reduced costs, buyer and supplier alignment in goals.	Geography plays key role in success. Not efficient at long distances.	NO
Vertical Integration	To acquire an ability that was once outsourced and incorporate it into the business structure. For example, a flour manufacture decides to farm the wheat for its flour and/or produce baked goods instead of just milling the farmers wheat and selling it to a bakery.	Inventory and cost reduction, higher product quality, on time delivery and easy scheduling.	Large capital investment, managerial talent and demand are required. Vertical integration can be extremely dangerous in Highly dynamic and quickly changing business environment (i.e. technology, computers). Unable to change supply chain without inducing major costs.	NO
Virtual Company	Supply chain strategy that relies "on a variety of supplier relationships to provide services on demand."	Low Cost, specialized management expertise, low capital investment, flexibility and speed.	Is demanding to manage because of its dynamic nature.	<u>YES</u>
Joint Ventures	Formal collaboration between businesses which insures supply and reduces cost.	Secure supply and reduced costs	Easy to lose a competitive advantage especially when time sensitive contracts are involved.	NO
Many Suppliers	Company maintains many suppliers and asks for a "request for quotation" which is a bid from each supplier and the lowest bidder becomes the new supplier.	Supplier must meet buyer's demands. Holds supplier responsible for maintaining the necessary technology, expertise, and forecasting abilities, as well as cost, quality, and delivery competencies.	Long-term partnering is not created. Harder to run a lean operation. Only cheaper in the long-run.	NO
Few Suppliers	Company maintains few suppliers and builds dedicated long-term suppliers who understand the buyer's needs.	Potential to incorporate JIT strategies. Better understanding of buyer and supplier needs that results in lower transaction and production costs, as well as Higher quality & reliability of goods and services.	Higher initial costs (buyer is responsible for maintaining the necessary technology, expertise, and forecasting abilities, as well as cost, quality, and delivery competencies until collaboration procedures become efficient in reducing prices.)	<u>YES</u>

Vertical integration, for example, is a supply chain strategy that is initially expensive, requires a high level of expertise in the potential area of expansion, and a solid company structure to mitigate management differences that might arise before, during or after expansion. Location is also a top factor when considering vertical integration because of the high cost and permanency that is required to purchase a supplier or distributor. Vertical integration can produce reduced inventory costs, higher product quality, and more on time deliveries. However, it

takes “time” to produce such positive results and “time” equals money. For most start up companies unlimited money is the one thing that is not in reserve.

Keiretsu is a term used to describe a networking model in which one company works with another to accomplish mutually beneficial business goals. The companies in a keiretsu often have investments in one another that grants them decision making rights and makes them less susceptible to hostile takeovers. However, many keiretsu networks simply share a mutual goal that is more easily attained if worked at together. Keiretsu networks are mainly found in Japan where the small size of the country and geography make it easier for companies to successfully interact in such a capacity.

Like vertical integration, there are two types of Keiretsu networks, horizontal and vertical. Horizontal keiretsu is much like horizontal integration where one company acquires a complementary or competitive player or product in the same industry to gain a competitive advantage by eliminating potential threats or gaining new insights and technology. However, there is a difference: Companies with a keiretsu network typically do not fully take over their competitors but instead own just a part through long-term equities or production activities. The idea is to be separate but align common goals. Thereby reducing financial risk and create long-term relationships that lead to greater growth than could be achieved by working alone.

Vertical keiretsu has the same concept as horizontal keiretsu however, instead of working with competitors’ vertical keiretsu is concerned with suppliers or distributors of finished products. An example of this would be a diamond ring manufacture that holds some stake in the mine where it receives its raw diamonds. Vertical keiretsus help align the goals of suppliers and distributors which often leads to a more lean operation.

Keiretsu networks are highly effective when supplier and distributor are in close proximity to one another. The geographical nature of Japan is what makes the keiretsu popular with Japanese companies. If a desire to locate the manufacturing plant in an area where supplier and distributors can be in close proximity the keiretsu could be an excellent supply chain solution for the power tool company. However, if close proximity is not attainable or geography makes it impossible the keiretsu-networking model should not be considered.

A virtual company “relies on a variety of supplier relationships to provide services on demand...(they) have fluid organizational boundaries that allow them to create a unique enterprise to meet changing demands. Suppliers may provide a variety of services that include doing payroll, hiring personnel, designing products, providing consulting services, manufacturing components, conducting tests, or distributing products. The relationships may be short or long term and may include true partners, collaborators, or simply able suppliers and subcontractors.” (Heizer & Render, 2010). A virtual company is especially known for being able to run a remarkably lean operation. Some of the advantages of a virtual company are low capital investment; prompt reaction times to market fluctuations; and specialized management expertise (Heizer & Render, 2010). The flexibility and low capital investment necessary to run a virtual company is especially useful for a start up

company that may not fully comprehend all future market reactions to new and future products.

Running a virtual company is demanding because of its dynamic nature. However, companies that can master its concepts can achieve supreme efficiency and success. It is important to note that the term “Virtual Company” does not signify a complete online existence. It would be unwise to expect a consumer of power tools to buy a product that he/she has never physically seen and touched before purchase. What this means is while the company itself may not have a physical location to sell its manufactured product, those products are sold in partnering wholesaler and retailer locations (i.e. Ace Hardware, Wal-Mart, Lowes, Home Depot, or other chain around the world).

Virtual companies can create many supplier and distributor options. Having multiple options can lower costs as suppliers compete for your business and take the cost demands of quality and forecasting into their hands. Conversely, by having many suppliers the power tool company will be less able to gain loyal suppliers. Without loyal suppliers it is much more difficult to achieve a lean operation which is the ultimate money saver in the long run. Therefore, Elektrowerkzeug would recommend that the power tool company operate a virtual company with few suppliers.

Metrics

Metrics are used to evaluate a company's performance against itself and competitors within the same market. Comparing metrics to other business periods can give valuable insight to current company performance. However, just looking inward is not enough. A company must also compare its metrics to competitor benchmarks. Comparing against benchmarks help companies understand how their performance relates to world markets. Improving your own supply chain strategy can begin at looking at competitor supply chains that are out performing your own and adapting to module their supply chain model to your own.

Metrics can be split into two groups: Supply-Chain Performance and Assets Committed to Inventory. Metrics like lead-time, time spent placing an order, percent of late deliveries and rejected material and the number of shortages per year measure supply chain performance and are useful in identifying “procurement and vendor performance issues” (Heizer & Render, 2010). While on the other hand metrics like percentage invested in inventory, inventory turnover and weeks of supply are used to gauge the amount of the assets committed to inventory and their performance.

Knowing your supply chain performance and the assets committed to inventory will be critical to running a successful supply chain in a virtual company as you will be working with many retailers, wholesalers, distributors and suppliers. Plus, “if you can’t measure it, you can’t control it” (Heizer & Render, 2010). Figure 2 presents four metrics that the power tool company should consider to gauge the success of its supply chain.

Supply Chain Metrics		
Assets Committed to Inventory	Definition	How to Calculate
Percentage of assets committed to inventory	The percentage of total assets that are being used to for inventory.	Percentage invested in inventory = (Total inventory investment / Total assets) X 100
Inventory Turnover	Shows how often inventory is sold and replaced within a given period. "Low inventory turnover is frequently associated with excess inventory, overstocking and the presence of dead inventory (non-moving inventory). Low turns also entails liquidity problems, with increased pressure on working capital. High inventory turnover is generally positive as it indicates goods are being sold rapidly. It may result from good inventory management, but may also hint at insufficient safety stock" (Mion & Vermorel, 2012).	Inventory Turnover = Cost of goods sold / Inventory investment Cost of goods sold = total cost to produce the goods or services. Inventory investment = (beginning inventory + ending inventory)/2.
Weeks/days of Supply	Weeks of supply is really another way to measure inventory turnover. However, the benefit is that the data is more comprehensible and can be more easily compared to lead time.	Weeks of Supply = 52 weeks / (COGS/Inventory investment) Days of Supply = 365 days / (COGS/Inventory investment)
Supply-Chain Performance	Definition	How to Calculate
Lead time (in weeks).	"The amount of time that elapses between when a process starts and when it is completed" (Investopedia, 2013)	"Lead time is broken into several components: preprocessing, processing and post processing. Preprocessing involves determining resource requirements and initiating the steps required to fill an order. Processing involves the actual manufacturing or creation of the order. Post processing involves delivery of products to the market. Companies look at each component and compare it against benchmarks to determine where slowdowns are occurring" (Investopedia, 2013).

Examples of Metrics		
	Typical Manufactures	Benchmark Manufactures
Percentage of assets committed to inventory	20%	5%
Inventory Turnover	90	13
Weeks/days of Supply (in days)	30	10
Lead time (in weeks).	15	8

Figure 2: Supply Chain Metrics & Examples

Complications in Establishing an Integrated Supply Chain

Three issues that could complicate the development of an efficient, integrated supply chain for a manufacture of power tools are: local optimization, bullwhip effect and large lots.

Take the problem with local optimization for an example. The goal of a company is to minimize losses and maximize profit. The way to maximize profit is to respond quickly to increases in demand and vice versa for losses. Sounds easy, right? When demand goes up, order more and when demand goes down, order less. However, the following example will demonstrate that supply chains are not masterfully managed on hunches but rather, numbers and facts. A grocery store in Twin Falls, Idaho may place a large order to its distributor for green giant split peas. The distributor assumes that the large order is due to an increase in demand for green giant split peas in general and places an even larger order to the manufacture of green giant split peas as to not run out of supplies from future orders. Compensation

for the spike in demand seemed like a good idea for the distributor until they realized a month later the grocery store was only doing a one-time non-recurring special on green giant split peas.

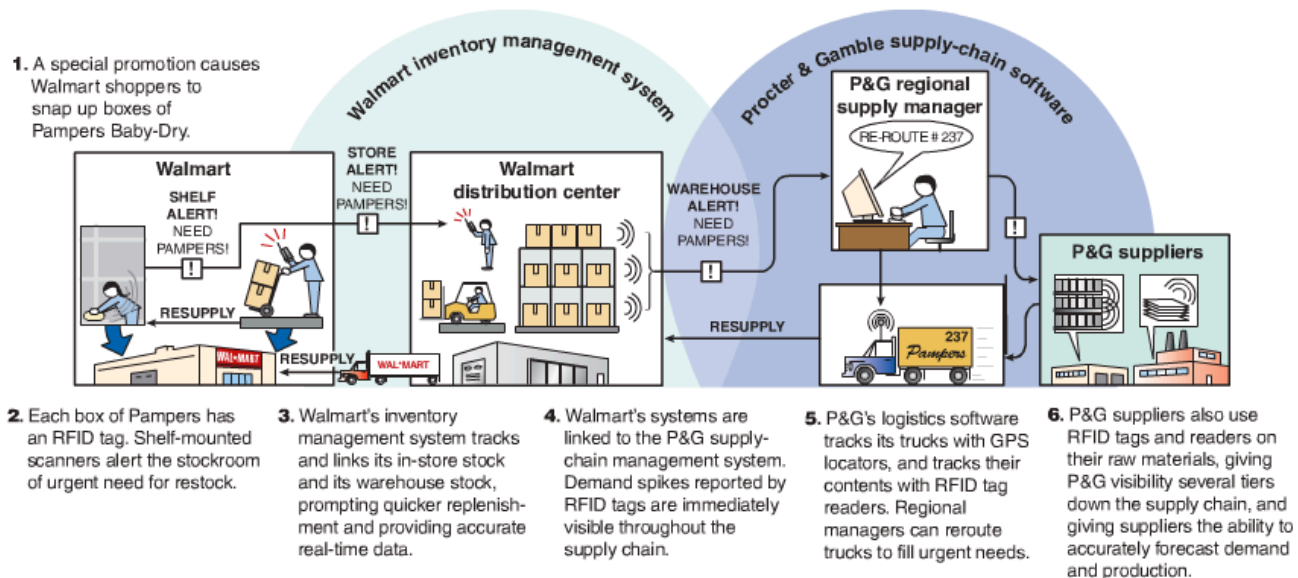
Communication distortions can be common in local optimization and within a supply chain. However they can be overcome and fixed. One way to avoid the ill effects of inefficient data communication is to establish a point-of-sales (POS) and computer-assisted ordering (CAO) system with distributors and retailers. “This implies using a POS systems that collect sales data and then adjusting that data for market factors, inventory on hand, and outstanding orders” (Heizer & Render, 2010). Such a system keeps manufacturer, distributor and retailer in tune with each other’s real time needs. Another way to decrease communication break down is to have a single-stage control of replenishment.

“Single-stage control means designating a member in the chain as responsible for monitoring and managing inventory in the supply chain based on the ‘pull’ from the end user. This approach removes distorted information and multiple forecasts that create(s)” what is called the, bullwhip effect. The end user could be a retailer that has a high-level of understanding of demand patterns. Figure 3 from Heizer and Render’s book, Operation Management 10th edition, gives an example of how Wal-Mart uses radio frequency ID tags to keep track of pampers on their store shelves.

OM in Action ► Radio Frequency Tags: Keeping the Shelves Stocked

Supply chains work smoothly when sales are steady, but often break down when confronted by a sudden surge or rapid drop in demand. Radio frequency ID (or RFID) tags

can change that by providing real-time information about what’s happening on store shelves. Here’s how the system works for Procter & Gamble’s (P&G’s) Pampers.



Sources: *Financial Times* (August 22, 2008): 12; *Business 2.0* (May 2002): 86; and *Knight Ridder Tribune Business News* (August 6, 2006): 1.

Figure 3: OM in Action

Another common misconception is loading a truck for shipment to the hilt is cheaper for everyone involved in the supply chain. Though large lots can “drive down unit shipping and production costs” they often do not reflect actual stock movement through sales at a storefront nor do they take into account the increased holding costs of large loads (Heizer & Render, 2010). Like most incentives, large lots “push merchandise into the chain for sales that have not occurred. This generates fluctuations that are ultimately expensive to all members of the chain” (Heizer & Render, 2010). Two ways to achieve lot size reduction are to provide “discounts based on total volume rather than size of individual shipments; and...reducing the cost of ordering through techniques such as standing orders and various forms of electronic purchasing” (Heizer & Render, 2010).

As you can tell there are many ways the power tool company could enhance the management effectiveness in an integrated supply chain. However, enacting all at once would be costly and unwise. Gaining control of your supply chain is a step-by-step process and should be done carefully so that the correct supply chain methods are selected for your company. Therefore, let me just mention two other ways to develop an effective supply chain.

First, the power tool company should work hard to standardize. Standardization means, instead of ordering and designing multiple different components, boxes, colors, bolts and screws, and other parts and goods a special effort should be used to use homogenize such things. Standardization, like using the same bolts to put together a power drill and an electric saw reduces cost and waste by ordering parts that could other wise only be used in one product.

Second, a special effort should be used to apply postponement. That is to withhold “any modification or customization to the product (keeping it generic) as long as possible. The concept is to minimize internal variety while maximizing external variety” (Heizer & Render, 2010). For example, Hewlett-Packard found that by changing its printer power supply to be external verses internal they were able ship their printers anywhere in the world and only change the power cord according to where it was being shipped. Such innovations reduce the risk and cost of redesigning an already functional product.

Supply-Chain Risks

To be able to mitigate risk, managers of the supply-chain must have a sound understanding of possible risks to the company and have a plan on how to react to that certain risk. Three possible risk areas are: “Processes (raw material and component availability, quality, and logistics); Controls (management metrics and reliable secure communication for financial transactions, product designs, and logistics scheduling); and Environment (customs duties, tariffs, security screening, natural disaster, currency fluctuations, terrorist attacks, and political issues)” (Heizer & Render, 2010).

To reduce process risk the power tool company may seek to have few but incredible suppliers who will afford a high quality at the lowest cost. Fewer suppliers also

means suppliers that will better understand your needs which increases your chances of the availability of materials and running a lean operation.

Control risk reduction can be accomplished in two ways, including a third party audit to ensure quality product designs and correct metrics are being used or through establishing a communication system that informs all suppliers and distributors of current engineering, scheduling and logistics data.

Environmental risk can be devastating and ruin a business. One efficient way to overcome environmental risk is to have at least two suppliers of each component and material needed to manufacture products. Having more than one supplier is especially important during times of natural disaster since the power tool company is seeking to have few suppliers. Suppliers should be far enough away from each other that the same natural disaster would not affect both and close enough as to reduce long delays and avoid large costs in the production process.

Organizational Structure

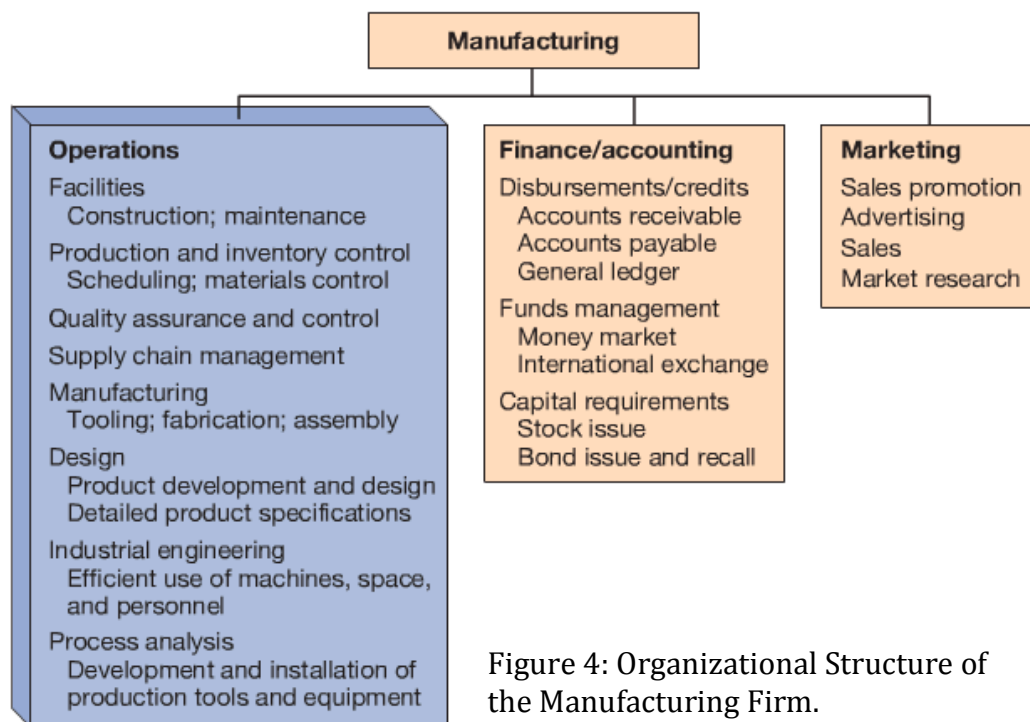


Figure 4: Organizational Structure of the Manufacturing Firm.

Figure 4 provides a good structure to on which to base your manufacturing firm. The areas in blue show the areas where operation management plays a substantial responsibility in both manufacturing and service firms. If each role is established within the firm it not only creates a smooth flow in the manufacturing and supply chain process but, also creates checks and balances for each area by not leaving any part of the chain unchecked. For example, one job of quality assurance and control would be to test the products manufacturing and work with production and inventory control, design, process analysis and industrial engineering to fix any problems that arise.

Strategic OM Decisions

Quality components, parts and products with out variation help the company brand live up to the expectations of its customers. However, to achieve a minimal variation, policies, procedures and a way to measure results must be instituted to ascertain and accomplish that quality. A six-sigma program could help to reduce process variation, measure manufacturing and business processes and give motivated direction to achieve specific company goals. Six-sigma refers to a statistical term that refers to achieving minimal variation. In a six-sigma program specific areas are targeted and given a precise goal to attain. For example: reduce pollution by 10 percent, reduce overall costs by 5 percent, and reduce manufacture defects from .04 percent to .02 percent. To achieve such goals the six-sigma program must have a committed organization and upper management.

Besides motivating employees, increasing customer satisfaction and giving “a clear focus on achieving measurable and quantifiable financial returns” six-sigma gives “a clear commitment to making decisions on the basis of verifiable data and statistical methods, rather than assumptions and guesswork” (Antony, 2008). Consumers of power tools want their tools to be long lasting, functional and high quality. Like wise, the power tool company wants to make the most amount of profit by reducing costs and waste. With six-sigma these goals can be quantified, measured and achieved.

However, before a six-sigma program can be initiated, goods and services must first be designed and a way to manufacture or provide said good or service must be selected. First, the way you design your power tools will determine how little it will cost you to make them and at what quality. Not all power tools are made equally and varying markets demand different sizes, power sources and functionality. For example, a mechanic needs a small power tool that can fit into tight spaces found in modern vehicles whereas, a construction worker needs a tool with ample power and durability to cut through large timbers and metal. Your designs will ultimately determine the rest of the manufacturing and supply-chain process. While the variety of power tools that can be made for residential and industrial settings is large the need to customize the actual power tool product is small. That said there are times a special power tool needs to be made to fulfill a specific purpose. These orders are usually rare and singular making them expensive and not much beyond their specific use. A good place for the creation of such unique products would be in the research and development area of the manufacturing plant. Mass customization, however, which “suggests a high-volume system in which products are built-to-order”, should not be undertaken as there is not a large or growing market customize the actual power tool unit at a high volume (Heizer & Render, 2010).

The manufacturing system you choose can greatly reduce overall production cost and increase product quality. Though the traditional “assembly or straight-line method is good, work cells reorganize “people and machines that would ordinarily be dispersed in various departments into a group so that they can focus on making a single product or a group of related products” (Heizer & Render, 2010). In other words, work cells take a manufacturing process from a step-by-step process and

make it into one seamlessly smooth following process. In essence you would be able to put raw materials into the beginning machine in a circuit and at the end of the circuit a power tool that is packaged comes out. Often such work cells are put in a “U” shape to improve communication between employees working on the circuit. Such communication increases quality and employee satisfaction.

According to Barry Render, work cells have “at least five advantages over assembly lines and process facilities: (1) because tasks are grouped, inspection is immediate; (2) fewer workers are needed; (3) workers can reach more of the work area; (4) the work area can be more efficiently balanced; and (5) communication is enhanced” (Heizer & Render, 2010). When considering work cells over traditional methods of manufacturing it is important to recognize that the power tool company must be able to identify product families in manufacturing and keep them separate and contained from each other, have highly trained and empowered employees, and the ability to test each cell station to insure quality control. Applying work cells at power tool manufacturing plant, though a heavy up front cost, would carry highly favorable cost cutting benefits in a short period of time. The likelihood of implementing a work cell manufacturing process should be very high especially if the company wants to achieve its lean operation goal and growth expectations.

Finally, proper location of the manufacturing plant is essential to its success. Things to consider when choosing a business location are competition, proximity to suppliers, Safety (environmental and human), zoning regulations and your plan for future growth. Also when evaluating a location it is important to understand what the labor market will yield. For example, will the location produce employees that have the knowledge and education to do the job and further help expand the growth of the company? Similarly, how far will the employees need to commute and what will be their wage? It is also important to remember that not all areas are business friendly. Unfriendly environments can range hostile big business views, high taxes or few government economic incentives. Lastly, beware hidden costs. “Very few places are business ready...(and can) include costs like renovation, decorating, it system upgrades, and so on” (U.S. Small Business Administration, 2013).

Cost Effectiveness: Manufacturing Facility & Supply Chain

No matter how good you're manufacturing and supply chain processes are hiccups are bound to occur. The following are some ways to minimize the possibility and effects of such glitches and interruptions in the manufacturing facility and supply chain.

Manufacturing Facility:

1. **Rework and Rejects:** Instead of throwing out power tools that are returned as a result of some manufacture defect these tools can be reworked and resold at a discount price. Rejects caught at the manufacturing plant can also be sold at a discount to recoup losses. In fact, Bosch, a popular power tool manufacturer, "has built a successful business selling power hand tools that have been remanufactured" (Wassenhove, 2002).
2. **Just-in-time policies and Practices:** Tight communication with suppliers and a sophisticated computer system can allow you to anticipate exactly the right time to order new supplies and avoid unnecessary holding costs from having to order large orders because of uncertainty.
3. **Use of optimization Decision Analysis Tools and Techniques:** Being able to accurately determine the most effective and cost effective way to assemble products can be a huge advantage.
4. **Preventative Maintenance:** Machinery used the manufacturing and assembly process needs to have regular and routinely scheduled maintenance to avoid costly delays that are the result of malfunctions and breakdowns.
5. **Avoidance of Unused Capacity:** as more units are produced the cheaper each unit is to produce. Every effort should be used to use every bit of capacity available.

Supply Chain:

1. **Quality Assurance program:** eliminate or appropriately minimize product or service failure returns. Product testing should be done to ensure compliance with company standards and goals. Six-sigma could be a good tool to evaluate and quantify progress.
2. **Tight Communication and Control:** Excellent communication with all aspects of the supply chain can result in the best match of inventories to demand in all components of the supply chain.
3. **Supply Chain Integration and Partnering:** Close and mutually beneficial relationships that reduce costs, build trust between suppliers and distributors and help the power tool company reach its goals in running a lean manufacturing facility and sales goals.

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