Applied Lean Thinking: General Usage Principles

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Abstract

Lean thinking has been on the leading front for manufacturing automobiles since the advent of Henry Ford's assembly lines in the early 1900's. The application of lean thinking is not limited only to the production of cars and trucks; its principles can be applied to any product manufactured in an industrialized society. Ohno's waste reduction and process improvement principles fit well into the philosophy of lean thinking and helps to create lean organizations. The aforementioned issues are discussed along with a comparison and discussion of the fourteen principles of Toyota to that of the Ford Motor Company.

Introduction

He that idly loses 5s. [shillings] worth of time, loses 5s., and might as prudently throw 5s. into the river.—Benjamin Franklin (Lean Manufacturing 2007).

As the automotive industry has grown, the need for a more productive method to build cars has come about. This need is even more prevalent in today's climate of manufacturing; as consumers have varying choices to make when purchasing an automobile. Automotive manufacturers have begun using a system called "Lean Manufacturing" (or Lean). This system became popular once again with the advent of the Toyota Production System (TPS) (Lean Manufacturing 2007), and has been implemented by most automobile manufacturers, including the FORD Motor Company (FORD).

The growth of the industrial revolution in the early 20th century brought about the advent of the moving assembly line by Henry Ford. Mr. Ford became one of the premier Lean thinkers. Arranging the workplace to produce a vehicle more efficiently (a focus of the modern Kaizen) helped to make FORD a manufacturing leader. The fact that Mr. Ford always thought of reducing waste is another aspect of lean thinking. The following quote by Harry Bennett (as shown in Wikipedia) is typical of Henry Ford:

> *"One day when Mr. Ford and I were together he spotted some rust in the slag that ballasted the right of way of the D. T. & I [railroad]. This slag had been dumped there from our own furnaces. "You know," Mr. Ford said to me, "there's iron in that slag. You make the crane crews who put it out there sort it over, and take it back to the plant." In other words, Ford saw the rust and realized that the steel plant was not recovering all of the iron* (Lean Manufacturing 2007).

As the United States of America's global commerce presence was expanding after World War II, the whole idea of Lean Manufacturing was rapidly falling by the wayside. As production in America was taking off, manufacturers started to overproduce and not utilize the lean concepts of waste reduction, batch and queue, and optimization of value added processes.
The 1934 entrance of the Toyota Motor Company into the manufacture of trucks and automobiles started the revolution of the TPS. With the advent of the "Kaizen" improvement teams, Toyoda Kiichirō (the first president of Toyota Motor Company) was able to improve the poor quality discovered in many of Toyota's manufacturing processes. To obtain process improvement, each step of the manufacturing process was studied through focused teamwork (Lean Manufacturing 2007). Taiichi Ohno, of Toyota, realized that work should not be derived by sales forecast targets or production targets, but should originate with automobile sales. This became the basis behind the "Pull" concept of lean manufacturing as well as the two main concepts of: Just-in-Time and Autonomation.

Ohno's concept of Just-in-Time is: "…the right parts needed in assembly reach the assembly line at the time they are needed and only in the amount needed (Ohno 1988)." To accomplish this goal, Ohno and his management team decided to reverse engineer the process. By putting the whole assembly process in reverse, it was possible to make sure that the right parts made it to the line *Just-in-Time*.
The idea that automation can have a human touch, or Autonomation, became another main factor in Japanese automobile manufacturing (Ohno 1988). This idea stems from the fact that today's machinery is so automated that they can quickly become damaged if a part breaks on the machine or scrap falls off the line and into production machinery; therefore, causing damage. By designing machinery to detect these slight variations, or problems, that occur in the course of production, defective part manufacture can be minimized and prevented. Adding to Autonomation, another point to consider is that by adding machinery to perform tasks, the number of workers to perform that task is reduced. With the help of machinery, one worker can attend to many machines and correct the problems that may occur.

The Eight Wastes

To become truly efficient in production methods, plant capacity must be determined. The formula, Present Capacity = Work + Waste, is the determining factor. Ohno (1988) states that the only way to become truly efficient is to eliminate the Waste portion of this formula. The eight identified wastes (muda, in Japanese) are (The Toyota Way 2007):

- Overproduction
- Motion

- Waiting
- Conveyance
- Processing
- Inventory
- Correction
- Unused employee creativity

Overproduction is caused when the goods being produced are manufactured to meet either production targets or sales targets. The main focus of the TPS is "to produce just what you need when you need it." The executives at Toyota were unimpressed by the overproduction of the FORD system when they first visited assembly plants in Michigan. It was not until they visited a Piggly Wiggly grocery store and noticed how workers reordered merchandise, and restocked shelves, that the concept of "Pull" really hit home (Ohno 1988).

Motion wastes are incurred when either the operator or the machinery makes too many movements to perform a certain task. Fortunately, much of this waste can be eliminated through time and motion studies. These studies help manufacturing professionals to re-engineer a particular task to eliminate this waste. Wasteful motions affect all jobs, whether it is washing clothes or putting bolts onto an automobile. Take for example someone washing a load of laundry, this person brings a basket of dirty laundry to the washing machine, then dumps that basket onto the floor to sort out the colors from the whites. This person has just created waste by sorting the laundry that way. It would be more efficient not to dump the basket, and instead sort out of the basket. This way the whites could be loaded directly into the washer while the colors are thrown into a separate pile. Likewise, the person that works on the assembly line could eliminate the wasteful motions of installing lug nuts on the vehicle by carrying all of the required lug nuts for each job with him/her. This way, the person would not put one lug nut on, turn around to the bin that holds the lug nuts, pick one up and install it, and then repeat this process for the rest of the lug nuts.

Next-step process "wait" elimination is done by assembly line re-engineering. Going back to the washing machine example, the person washing the clothes could re-engineer the process by first washing clothing that needs to be ironed. This way, the person is busy ironing clothes while others are in the wash/dry cycle. When ironing is complete, they will have to wait less time to fold the next set of clothes coming out of the dryer. Then while folding clothes, other activities can be accomplished instead of only waiting on clothes washer/dryer completion.

Automobiles in assembly undergo various manufacturing stages. These stages will require that some assemblies (such as doors, seats, instrument panels) need to be built in such a way that they are ready to go into the unit as needed. As these various parts are assembled either in a different area of the plant (or from outside sources), they will have to be moved to the assembly line in some way. This can be either by a conveyor line, Automatic Guided Vehicles (AGV's) or by using forklifts to convey materials to job locations. By eliminating the amount of travel (or even putting in conveyor systems that increase travel speed), and the amount of extra hands that are necessary to get that part to the line, the process is improved.

When a particular part is manufactured for a job, e.g. a bracket to hold on vehicle bumpers, or even changing in between jobs for new color paint, there is always waste. Eliminating waste completely may not be achievable; however, eliminating a portion of that waste can be done by, again, re-engineering the process. Carrying on with the washing machine example, by changing machines from a top load machine which uses approximately 50 gallons of water to wash clothes to a front loader that only needs 20 gallons to wash the same load of clothing will eliminate 30 gallons of waste water; therefore, saving money. In an automotive plant, the idea of batch painting helps to eliminate waste. The old technique of painting every car that comes down the line a different color would waste solvent that is necessary to purge the paint lines between colors. Utilizing batch painting, the cars are set up in a way that the automation will paint so many vehicles in a row that are the same color before the paint lines are purged out in preparation for the next color.

As vehicles are produced, raw materials are brought to the assembly line. This system of having parts delivered to the assembly line is part of the TPS "Just in Time" concept. These parts are delivered to the assembly plant just before they are required for use. This way, parts are not sitting on a shelf in the plant for an extended period of time. By using the Just in Time delivery method, all costs associated with storing these materials are eliminated from the end product. This also eliminates the waste associated with storing parts and supplies long-term in the factory. The extra space once required for parts storage can now be utilized for some other purpose. Over the course of producing a vehicle, assemblers install many different parts. By eliminating corrective actions needed to repair the items that may have been either bad or installed incorrectly, this seventh waste can be deterred. Defective parts could have been manufactured wrong at the supplier, or parts could have been damaged in shipment, or even damaged in some way during installation without the assembly operator even realizing it. Suspect parts may not be found to be bad until the vehicle is finally assembled; therefore, causing a reworking of the vehicle to replace a faulty part. Although if there is a method of inspecting parts before installation, or even inspecting throughout the process to stop the costly rework after the vehicle is built, waste may be minimized.

Production line assemblers have great ideas for process improvement and waste reduction efforts. Managers who realize this are in effect using their greatest resource and helping to reduce waste. Through implementation of ideas, assemblers gain confidence that their input is important, which in turn results in greater involvement in process improvement and waste reduction. While the improvement may be as simple as restructuring the job to make the most use out of the time involved, or how to better handle part supply issues, the net effect is reduced waste and hence greater return on investment for the company.

Building a "Lean" organization

Truly going Lean means that the company should follow the fourteen principles that have helped to make Toyota a success. According to The Toyota Way (2007) these principles are:

1. ***Base your management decisions on a long-term philosophy, even at the expense of short-term financial goals.***

The first step of basing your management decisions on the long-term is a very tough step to accomplish. Trying to explain your decisions to stockholders who are not interested in the long-term can be a challenge; however, by thoroughly explaining these goals, the financial rewards can be a boon for both the company and the shareholders that stay in it for the long-term. Also, opposition from employees may occur from those who think that the new approach is just another "flavor of the month". Again, by addressing concerns with employees and allowing them to have an input in the process, employees are given an opportunity to feel useful in the process.

2. Create a continuous process flow to bring problems to the surface.

Redesigning work processes to eliminate waste (muda) and using the continuous improvement teams (kaizen) helps to bring assembly problems to the surface. Using Ohno's principle of asking "why" five times will help the kaizen process (Ohno 1988).

- *Why did the machine stop? There was an overload and the fuse blew.*
- *Why was there an overload? The bearing was not sufficiently lubricated.*
- *Why was it not lubricated sufficiently? The lubrication pump was not pumping sufficiently.*
- *Why was it not pumping sufficiently? The shaft of the pump was worn and rattling.*
- *Why was the shaft worn out? There was no strainer attached and metal scrap got in.*

This process of asking why will help get to the root cause of problems, not just an address symptoms.

3. Use "pull" systems to avoid overproduction.

Allowing a process to signal preceding processes when it needs a part utilizes the "Pull" system. Utilizing this system, allows a manufacturer to let suppliers know component or product demands for their customers. If an automobile plant produces more grey interiors than any other color, they can utilize the principle of "pull"; thus, they can let suppliers know when to send more grey parts, tan parts, etc. This also works in-plant as well. The nature of the assembly line dictates that many different areas of the plant will "feed" the main assembly line. It might be the area where the tires are mounted on wheels, or the engine line feeding the chassis line, therefore, all of the various feeder lines must know what parts are needed and when. If they do not, then the main line will have to shut down until the correct parts arrive. *Kanban* (or sign board) became the technical term that was used to communicate what parts were needed where and at what time. (Ohno 1988)

4. Level out the workload (heijunka). (Work like the tortoise, not the hare).

There is one simple rule about all machinery, it will always need preventative maintenance and will eventually break down. There are instances where management forgets that simple concept. The thinking generally is: "if we install a machine to perform a task that a human does, then we

can perform that task faster and more reliably". The other school of thought is that we have a machine in place, therefore why should we perform preventative maintenance? According to Ohno, the factory should work more like the tortoise, not the hare (Ohno 1988). The fact that the machine can perform tasks quicker may be true, but the machine may not be designed to perform that quickly for a long period of time. Utilizing equipment in a part-producing aggressive way, may look good on the daily or weekly production outputs, but in the long run, potential equipment downtime may be greater, becoming a detriment to production levels over the long haul.

5. ***Build a culture of stopping to fix problems, to get quality right the first time.***

Assembly lines (no matter the business or industry) can have costly mistakes. Mistakes can manifest themselves in many ways. For example: a person installing wire looms onto a firewall behind the dash board installs the wrong wire loom; the next person who installs the dash doesn't notice this problem and installs the dash. Although this isn't discovered until a few more jobs down the line, the production line either has to be shut down to correct the problem or the unit has to be set off the line to be fixed. Either way, this is very wasteful. Promoting a culture of allowing the workers to stop production lines for quality issues will help prevent defective items, and help get quality right the first time.

6. ***Standardized tasks and processes are the foundation for continuous improvement and employee empowerment.***

Many people work in an automotive assembly plant on various shifts, therefore it is necessary that workers who perform identical tasks do so in a pattern that can be repeated the same way every time. Standardization of the individual jobs will help to alleviate problems that may come up. Standardization aids in the continuous improvement process by helping management and operators determine causes for the problems that are being studied; as well as, give employees an opportunity to reformulate the job structure if they see a more economical way of performing the task.

7. ***Use visual control so no problems are hidden.***

The visual control aspect of the TPS incorporates the 5S Program. This program helps to increase efficiency and productivity at each workstation. The 5S's are: Sort (get rid of unneeded items), Straighten (make sure that everything is in its place), Shine (clean up the work area), Standardize (make sure each operator is performing the task the same way), and Sustain (keep the system going and continuously improve) (The Toyota Way 2007). The usage of various techniques, i.e. stopping the line, having standardized jobs, Autonomation, and Kanban, will also show when an abnormal situation arises. If a product does not meet quality standards, this will surface as well since it is being compared to the rest of the production units.

8. ***Use only reliable, thoroughly tested technology that serves your people and processes.***

According to Wikipedia, concerning the Toyota Way, "Technology is **pulled by** manufacturing, not **pushed to** manufacturing (The Toyota Way 2007)." When a new gadget comes out on the

market place, it is always necessary in the workplace to determine if that new equipment will meet the needs of your process and the needs of your workers. Take for example a doctors office. The doctor's office manager learns of a new networked office printer, a.k.a. "The Humungojet 1000." The office manager decides to purchase it and take away all of the printers attached to various computers throughout the office. The new printer proves to be very efficient, but the facts are: it is located in the far corner of the office building because of its size and noise output, and workers are spending greater amounts of time walking to and from the printer for printouts. Therefore, this printer should never have been bought in the first place; even though the printing costs may appear to be less per page than the previous multi-printer system, work productivity has gone down and higher overall costs may have surfaced.

9. ***Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others.***

Lean manufacturing is not just a tool to use; it is a philosophy that must be engrained in the whole company. Managers need to be groomed, be excited about a methodology, have a thorough understanding of the methodology, and then teach it to employees. If managers fully appreciate the work, they will become the best managers for the company; because, having viewed problems first hand, they are able to instill the philosophy to others day in and day out. Utilizing these managers, who have great knowledge of the systems and can pass on that wisdom to others, will make for more efficient operations.

10. ***Develop exceptional people and teams who follow your company's philosophy.***

Initiating the process of Lean Manufacturing requires many different pieces to come together at once. The main piece of the puzzle that must come together first is workers plus the attitude they bring to the job to implement this change. Companies must have workers (leading the teams) that share the vision of where the company will end up when the Lean system is in place. In essence, the company must "train the trainers." This initial training cost will be high; but, when the company truly becomes Lean, it will be a worthwhile expense.

11. ***Respect your extended network of partners and suppliers by challenging them and helping them improve.***

Another piece of this Lean puzzle is to encourage your company's suppliers to incorporate this system. The fact that they will be supplying parts as you call for them, or "pull" them, will necessitate them to change over to a lean system as well. Challenging supplier philosophy through the change of their system will not only help them to reduce their costs, the cost savings can be passed on to your company as well. To help these suppliers, it may be necessary to send some of your employees who are trained in Lean methodologies to train your vendor's employees.

12. ***Go and see for yourself to thoroughly understand the situation (Genchi Genbutsu).***

When there is a problem on the production floor, it is always advantageous to see first hand what the problem is (Genbutsu n.d.). By doing this, management can see and understand problems

much better, and make a decision that will implement the change the best way. For example, management hears about a problem with one of their manufacturing robots. Instead of investigating what the problem is, they decide to just replace the robot because they have had problems with that particular machine in the past. But the reality is that the actual problem with the robot is due to poor programming. This could have been a costly idea to replace the whole robot when all it would take is a little time from the operators to reprogram it back into the specs required.

13. Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly (nemawashi).

When the time comes to make a decision on something that has gone wrong, it is best to see what the problem is firsthand (Genbutsu n.d.). After seeing the problem, data must be gathered from various sources to determine the actual problem using the five "why" process. From asking "why", various alternatives can be discussed with the employees involved (kaizen process) to determine the proper course of action. When the proper action is decided on, it must be acted on swiftly; however, the action may be the incorrect one, so it should be overseen and changed if it is found to be a wrong solution.

14. Become a learning organization through relentless reflection (hansei) and continuous improvement (kaizen).

Initiating the Lean philosophy in an organization requires that the organization becomes a learning environment. Every aspect of the company must be looked at with a critical eye to details. The company must take a hard look at itself to determine not only its current-state, but also where it wants to be (future-state). To get there: one must learn all the current details of the individual processes, determine how the process can get better (five "whys") and eliminate the muda by utilizing value stream mapping (as seen in the text *Learning to See* - Rother & Shook 1998).

Implementation of Lean Manufacturing at Ford Motor Company

As noted earlier, Henry Ford was one of the original Lean thinkers. His vision of creating the assembly line revolutionized the industrial movement. This creation allowed the cost of the Model T to drop from $850 in 1908 to $290 in 1925 (Ford Model T 2007). The process also allowed a Model T to roll off the line in 93 minutes of production. His book *My Life and Work* was the basis for Taiichi Ohno's development of TPS.

As Henry Ford II took control of Ford Motor Company in 1947, the U.S. was experiencing a huge surge in production. All plants were running at full capacity and Henry Ford II placed more emphasis on the financial and accounting aspects of the business; therefore, neglecting the manufacturing side of the process (Womack 2007). Customers wanted more variety, and FORD responded. By utilizing mass production methods, the company created higher inventories of parts, supplies, and finished products.

Comparing the Ford Production System (FPS) to the TPS will yield the following:

1. ***Base your management decisions on a long-term philosophy, even at the expense of short-term financial goals.***

The basis of the philosophy of FORD is to "Exceed Customers' Expectations". To meet this goal, FORD developed the FPS. This system is a new philosophy at FORD that will help reduce waste, create a just-in-time environment, help to reduce product development time to less than 24 months per vehicle, allow the plants and employees to be more flexible and motivated, and create quality vehicles with world class reliability.

2. ***Create a continuous process flow to bring problems to the surface.***

In the late 80's/early 90's, there was a way for employees to have some input in the process of the production. This system was titled: "Employee Involvement". It had some good aspects come about, such as reducing cost of a particular part, redesigning a job to make the process more efficient or more ergonomically friendly; however, it was a voluntary system. With the FPS system, there is more involvement from not only the individual worker, but management as well. During the problem solving, the five "whys" are continuously used. The DMAIC (Define, Measure, Analyze, Improve, and Control) of the Six Sigma process is utilized to correct problems.

3. ***Use "pull" systems to avoid overproduction.***

FORD has instituted a program where an operator on a job will push a tracking device when they are at a minimum number of stock pieces. This allows both the stock department and the supplier to know when and where to send more stock. Another system that has been put into place is a large warehouse that contains all the vehicle bodies in various colors for the production line to "pull" from. By utilizing this warehouse, the paint and body departments can then re-supply the "shelves" of the warehouse.

4. ***Level out the workload (heijunka). (Work like the tortoise, not the hare.)***

At FORD, as well all major car manufacturers, robots are employed in all areas of the assembly process. These robots have the ability to work at a faster pace than a human does; however, this speed will cause more breakdowns as the machinery is designed to work at an optimum speed (this optimum speed has been figured out by both management and skilled trade workers). The addition of preventative maintenance on these various machines also enables them to have a much longer life cycle.

5. ***Build a culture of stopping to fix problems, to get quality right the first time.***

In the days of mass production, the amount of production that got off the line was the benchmark. With the concept of Lean, building a quality product at FORD has been brought back to the forefront. Customers demand high quality, and FPS re-instills that concept. The usage of the "Stop" button program allows workers to stop the production line if they see a

quality issue reach their work station (such as the incorrect wire looms). This process has helped improve the quality of the vehicles as can be shown in the latest J.D. Power and Associates report, in which FORD products have taken the top spot in initial quality (J.D. Power and Associates Reports: Ford Motor Company Captures Most Awards in 2007 Initial Quality Study).

6. ***Standardized tasks and processes are the foundation for continuous improvement and employee empowerment.***

At every workstation on the assembly line, FORD has placed a description of how a process is to be completed. This has helped to standardize the process between shifts, and allowed for the operators on those jobs to help improve their tasks and eliminate waste. It has also made its way into the indirect labor positions with a standardized tool set that allows workers on various shifts to perform the maintenance tasks with the same level of expertise.

7. ***Use visual control so no problems are hidden.***

Utilizing the 5S system, FORD has:

- Sorted out all unneeded items
- Straightened up the workstations to put everything in its proper place
- Shined up the work areas by cleaning them and also adding extra lighting where required
- Standardized jobs to make sure everyone was performing in the same way
- Sustained the system by keeping the FPS system going and constantly improving where needed.

In addition, by utilizing Andon (signal) boards, everyone in the process can see where an operator may have a problem and need help. This helps to make a problem visible allowing the continuous improvement process to work to its full effect.

8. ***Use only reliable, thoroughly tested technology that serves your people and processes.***

FORD has utilized its skilled labor force in this way for quite some time. By allowing workers to have process improvement input, concerning the various equipment used in the plant, has eliminated many costly mistakes. It ranges from just making a few modifications to the piece of equipment to help increase productivity, to making major changes so the equipment is easier to maintain.

9. ***Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others.***

The FPS philosophy has been taught at every level of FORD. This philosophy is also energetically taught to all workers even outside of a classroom setting. Granted, some of the newer members of management are directly out of school; however, the fact that Lean and other quality initiatives are being taught at colleges and universities give these members a good foundation to help the company improve and practice what they teach.

10. ***Develop exceptional people and teams who follow your company's philosophy.***

When first implementing FPS, it was necessary to send many people to classes about FPS. This training cost was extremely high; however, it was very important to have many people become the trainers for the rest of the plant. The usage of FPS teams in each area, that resolve issues for that particular area, is a major source of improvement. These teams focus on minimizing waste and becoming more efficient at what they do.

11. ***Respect your extended network of partners and suppliers by challenging them and helping them improve.***

FORD has worked with its suppliers to utilize the "pull" system. The advent of the "Where Net" system to track parts and materials used in the assembly process has had a dramatic effect on lean implementation. By having a push button module by each parts bin so the operator can call for parts, alerts not only the stock department that the parts need to be replenished; that call also goes to the vendor to send more parts. Lastly, the incorporation of re-usable parts bins has helped to eliminate waste cardboard.

12. ***Go and see for yourself to thoroughly understand the situation (Genchi Genbutsu).***

The usage of the Andon board allows management to know where a problem is occurring, which in turn allows them to understand what is going on. It is also not uncommon to see upper management show up at various line breakdowns or at sources of quality issues. In addition, when Kaizen teams are trying to solve a problem, they utilize this process so they can make the proper recommendations.

13. ***Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly (nemawashi).***

As the Kaizen teams are working on a solution, they ask the five "whys". They also work together using the DMAIC process to administer a solution. When a solution has been found to resolve the issue, it is implemented. If this solution affects other facilities that build the same model, then that solution is enacted there as well; therefore, increasing quality system wide.

14. ***Become a learning organization through relentless reflection (hansei) and continuous improvement (kaizen).***

The ongoing continuous improvement has helped achieve many goals, such as: reduced waste, increased productivity, and also increasing quality. As FORD struggles back to profitability, as described in the *Way Forward Plan*, it is going to constantly strive to improve. All areas of the assembly process are constantly being analyzed to determine where improvements can be made. If there are improvements that can be made, workers have the opportunity (through weekly meetings) to describe these improvements and help in the changes.

Results of this Implementation

At the start of FPS, in 1996; it took an average of 37.59 labor hours to produce a vehicle (Assembly Plants: How They Compare - Harbour Report on Automobile Assembly Plant Productivity 2007). This average has gone down to 35.82 labor hours according to the latest *Harbour Report* (Harbour Report: GM and FORD more efficient, still lose money on every vehicle 2006). The initial quality according to J.D. Power and Associates has also improved dramatically. The industry average of Things Gone Wrong (TGW) is 125 events for 100 vehicles for the past year. The FORD brands of Lincoln (100 TGW), Jaguar (112 TGW), Mercury (113 TGW), and Ford (120 TGW) were below that average. The top manufacturer in this study is Porsche with 91 TGW. (Fossen, 2007) To follow with this study, FORD products garnered five of the top spots. They are:

- Best Entry Premium Car—Lincoln MKZ
- Best Large Premium MAV—Lincoln Mark LT
- Best Midsize Car—Mercury Milan
- Best Midsize Sporty—Ford Mustang
- Best Compact Sporty—Mazda MX-5 Miata

This is the first time, since 1998, that FORD has been in the top spot for this award. (FORD takes top spot in J.D. Power and Associates' Vehicle Quality Ranking 2007) In addition to the above vehicles gaining top spots, FORD's Wixom Assembly Plant received the Platinum Award for the world's best quality performance.

Unfortunately, due to the declining market share, FORD has had to make some drastic changes to its operations. Various media outlets have covered this change and it is called "The Way Forward." This plan has caused various plants to be closed down, workers laid off, and a change in worker compensation. However, because of the implementation of the Lean processes, many of the plants have become much more cost effective as well as more flexible in the various units that it can produce.

Summary

The varied history of the automobile, specifically the assembly of it, has taken many different paths. It started with the wooden frame Model T and has followed roads to the carbon fiber bodies of today. The actual assembly process, however, has not really changed all that much. Granted, there are many more parts that go into today's automobiles than that of the Model T; however, bodies must still be put together, paint must still go on, the chassis and trim must be installed. It has been suggested that if Henry Ford II was the manufacturing guru that his father was, then manufacturers would be copying the Ford Production System; however, according to Jim Womack, of the Lean Enterprise Institute, "FORD needs to remake itself once more, this time in the image of the company that copied FORD's original system: Toyota (Womack 2007)." Applied Lean Thinking is evident at FORD, other companies will do well to consider and implement the same philosophy in order for processes to be improved and waste reduced.

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