Reflection on the evolution of the lean system assignment

Reading the six books recommended by our professor to Illustrate the historical evolution of lean systems, I have found the book The Machine that Changed the World by Woman, Jones and Ross to be the most informative This book demonstrated the roots of lean systems to where It Is being applied today. The first one, craft manufacturing, focused mainly on providing exactly what customers ask for regardless to the cost and paying little mind to the amount to output.

Next, mass production, pioneered by Henry Ford, revolves around the philosophy of being able to reduce more. The philosophy of lean system is to eliminate wastes in all aspects of production and achieve perfection. Its success cent be attributed to the benchmarking method done on its predecessors. Keywords?? Lean Production, Toyota Production System, Just In Time, Mud, Kanata, Kamikaze, The entirety of the lean systems originated from the automotive industry.

The competitive and innovative nature of the Industry and its various players brought about multiple types of manufacturing styles which ultimately culminated Into the one we know today. Lean production, a management approach developed by the Japanese, aims in touting the non-value adding activities or simply the wastes of production, This approach was pioneered by Talc Non and III Toyota. It uses the half-life concept by using half the human effort, half the manufacturing space, half in investment in tools, half the engineering hours to develop new products using half of the Inventory.

Moreover, lean covers improvements on quality, cost and cycle time. The adoption of Its principles has Inevitably spreads beyond the auto Industry

and will change everything in almost every industry, from manufacturing to service. I have deed the six books recommended by our professor to discuss the historical evolution of lean systems. Given that there were several materials to be read, d good strategy must be developed. I have used the main topics to look for at each book and then I have listed down the summary per topic.

This approach will allow me to dissect the specific details continuously from one book to another. The recommended books are scattered In Tour Rene Derailed Walton multiversity AT ten penniless . Nine Reese books were photocopied and the circulation ones were borrowed for two-week duration. The history of Lean Manufacturing all began in the automotive industry, it’s challenging and shifting environment brought about vastly different production philosophies.

The very root of production systems stems from 1887 when Poniard ET Elevators (P) started the producing automobiles using Craft Manufacturing [1]. A. Craft Manufacturing This system utilized a highly skilled workforce; a decentralized organization concentrated in a single city, general purpose machines and tools and had very low production volume and high product variation. This workforce was needed to adapt o the prevailing environment of customers wanting to get exactly what they want and there was no high demand at the time due to the high prices demanded by the costs of worker’s wages that were making the products.

I was able to surmise from the readings that the human workforce, at the time, was tasked with the major processes in the manufacturing of the

finished product, thus their skills were highly coveted and well compensated. The trade off in using people to do the major processes was that even though there was a high variety in the product mix, the output was severely limited due to the myriad of constraints that humans had, such s, working time, pace of work and consistent repeatability.

Machines and tools at the time were only used for the smaller Jobs such as general processes, I have noted that they must have been poorly utilized since they can perform tasks faster, but wait on the Jobs that are done in the large part by human workers. The general purpose that they cater to are a small percentage of the overall value adding work to the product thus giving the impression to me that machine and tool capability and capacity was greatly neutralized at the time.

The management style of this system, which was giggly decentralized although residing in a single city was good for the close monitoring of each part the went into final assembly, but not so favorable when it came to teamwork and coordination in order to make builds faster and more seamless. Given all these factors, the result was a system which had very low production output due to the huge chunk of the work being designated to craftsmen with many limitations and the need to satisfy the customer’s varying needs.

But despite all these drawbacks, in 1905, Western Europe and North America were producing automobiles in small volumes using these craft techniques. B. Mass Production In 1908, Ford’s introduction of its Model T was the dawn of a new era, the era of Mass Production. The environment shift in consumer

attitude was mostly the driving force behind the change from craft to mass. When before consumers wanted custom built products no matter the cost, now the buying public grew in size and demanded more product even if they were the entire same model.

These changes in consumer tattletales or ten consumer environment created a system uniquely Selenga to cater to this new found surge in demand. The system’s goal is to integrate the entire production system into one huge bureaucratic command structure with orders owing from the top. The Model T achieved two key objectives in its drive for mass production; these were its design for manipulability and being user-friendly. The key to its great manipulability lies in three things, the complete and consistent (1) interchangeability of parts, (2) simplicity and (3) ease of attachment.

With interchangeable parts, it wasn’t difficult to put together the finished automobile when it came to final assembly, specialized parts and connectors of the like became obsolete and too costly and I believe was seen as an overkill for the intended use. Simplicity is key in making anything easy to manufacture, when plans, processes and parts are simple, then they can easily be assembled into the final product because they are easy to understand and use. And lastly, the ease of attachment of not requiring tools to attach or connect various parts together greatly diminished the cycle times for each process.

In 1913, the Continuous Flow Assembly Line was introduced, wherein the assemblers became stationary with a steady flow of parts coming to them. This system eliminated the occurrence of hang ups and overtaking due to

the different paces of work of each individual worker that occurred when assemblers were the ones moving from place to place in the production area. Now, the steady stream of parts given to assemblers and their outputs can much easily be planned and coordinated to avoid overproduction on any side.

In 191 5, the separation of labor was introduced, wherein many support/indirect labor was added to the workforce in order to have assemblers focus on the task at hand. This move of course reduced direct labor cost but shifted it to indirect labor. Among the examples of specialized personnel hired were Industrial engineers, Production Engineers, Housecleaning workers, Skilled Repairmen, Specialists and Reworks. These specialized personnel focus on specified areas in the production area to allow for hiring of unskilled to semi-skilled assembly workers that focus on the smaller Jobs or maintenance of the high capacity machines.

Around the same time the mass producers adopted vertical integration of supplies. The parts and services that they outsourced before now became part of a vertically integrated system in which they became their own suppliers, able to control production even from the supply side. In stark contrast with the previous Craft Production, machines and tools used in Mass Production were designed to do Just single tasks at a very high production output. With production relying heavily on the continuous output of these machines, very high inventories were maintained to be able to run the machines without stopping due to shortages.

In the case of shortages happening, the high inventory would be enough to keep machines producing until problems are fixed and inventory can build-up again. It is also to this end that huge Distances were mace, tons Is Decease ten machines were Selenga to ah Just one thing and not change as much, and they were not flexible. Changeovers at the time would last for many hours so they were minimized and the result was the large batch production. This caused problems for high inventory cost because of the amount of space needed and holding costs for the entire inventory maintained to sustain this type of production.

Also, the large batches of production caused problems due to overproduction issues, wherein since the capacity was so high and succeeding processes were not as fast; defects produced would take much longer to be detected at the next process, causing more and more units to be produced before detection. All these defects produced would then impact the production because of the amount of rework that has to be done in the end or even risk being scrapped entirely. During this period when mass production was the dominant force, reworking was tolerated in the industry.

The reason behind this was that the cost of stopping the specialized machines to fix defects right away was far greater than the cost of reworking the product at the end of the line. The concept of quality at the time was just to ensure that even though defects are produced, they should Just be reworked and be kept from external inspectors. In 1925, as the tools and machines utilized became more and more standardized to reduce set-up times, the diversity of models available to various makers were limited at the same rate.

Since tools and machines were standardized, they became easier and easier to use but at the same time had their capabilities severely cut down, thus the resulting limitations in model variations. C. Lean Production In 1937, the Toyota Motor Company was founded and part of it was the proponents to Lean Manufacturing, Elli Toyota and Attach Non. It was in this era and environment that the concluded that " Mass Production could never work in Japan". This was a war torn era, and by the end of the war, Japan had lost and in a state of ruin.

The economic climate was Just right for the concepts of lean to be born. The pilot concept was the recognition that mass production had so many wastes and many techniques and concepts came about in order to minimize or even ultimately eliminate these wastes. 1) Mud (waste in Japanese): There are two types of mud. Type I Mud are the activities that create no value but seem to be unavoidable with current technologies or production assets. Another, is Type II Mud are the activities that create no value and are immediately avoided. The latter have 8 classifications under it.

First is motion, a poor layout design affects the productivity of workers and machines severely by performing unnecessary motions through walking and or driving. Another is delay, this increases lead time as operations wait for material or as a result of line stoppages. In addition, it can have an effect on the customer service due to delayed deliveries. Third is conveyance; this is caused by poor layout traditional batch production. If inter-related processes are moved closer together, this will be reduced. Fourth Is correction; Telling detective products as a alert erect on cost.

HTH preprocessing of goods is when you do extra activities not required by the customers. This is related to the next one, which is inventory. Unnecessary inventories are classified as bad inventories. Next is overproduction, is when products produced are not sold. This is also the root cause of other types of inventory including waiting, motion and inventory. Lastly, knowledge disconnection. A poor flow of knowledge, ideas and creativity in the organization nanas a poor collaboration among supply chain partners can also lead to knowledge disconnect in the organization. Seven Zeroes: The concept’s goals are the seven zeroes; zero defects, lot size, setups, breakdown, handling, lead time and surging [2]. The first is self-explanatory, no defects means no delays in the production, thus there will be no issues regarding the movement of inventory. Zero lot size doesn’t actually mean zero, it basically means, no excess lot size. Producing only what is needed and the capability of the next process so as not to accumulate any inventory due to overproduction.

Zero setups refer to the minimization of preparation time prior start of production, these activities must be carefully planned out so as not to prolong and cause disruption in scheduled production. Zero breakdowns involve the concept of total preventive maintenance so as not to encounter any unplanned breakdowns that would hinder the smooth flow of production. Zero handling addresses the issue of having to transport parts or units from place to place, increasing the risk of damage and defects.

Zero lead time means that when parts are needed, they are requested and arrive not long after thus eliminating the need for safety nets and excessive inventories. And lastly, zero surging means that there will be no instances

when reduction would fluctuate from going full blast to being down, a steady and continuous pace is desirable. 3) Just in Time TIT): One is the concept of Just-Len-Time TIT), it is the counter for the massive inventory that mass production maintains because its main principle is having an inventory of no more than an hour’s worth of work, and the processing of the inventory is Just in time.

This concept provides visibility for results so that worker responsibility and commitment are improved. The main idea of this principle is plain; produce and deliver finished goods Just in time to be sold, subassembly Just in time o be assembled into finished goods, fabricated parts Just in time to go into subassembly, and purchased materials Just in time to be transformed into fabricated parts [4]. This hand-to-mouth mode of operation, approaches piece-by- piece production [4].

Transparency is also being observed, once an employee makes a part and passes to the next station immediately, the first employee will hear the feedback on how the part fits to the next station. Therefore, defects are discovered fast and resolved fast. 4) Kanata System: To be able to fully implement the KIT approach, the Kanata system is a must, it is the concept of a pull system. The exact opposite of the mass production push system where manufacturers simply produce everything at full capacity and push them into the market, hoping that they would sell and thus wasting valuable resources.

This system starts from the customer, where in the customer generates the demand and creates the “ pull” in the system Ana tons pull s tarts eve

retying moving wanly causes a need to De Tattle In every station. Moreover, Kanata is the visible record that triggers an order for more parts. If a Kanata arrives at a work center signaling the need for more of a given part, that art is needed right away. It must be possible to set up the part fast enough to economically make the very small quantity required.

Other work centers will send more Kanata to signal the need for other parts, and numerous new setups will be required each day as the Kanata arrive [4]. 5) Master Production and Final Assembly Schedules: Another key in implementing KIT is the use of master production and final assembly schedules, these offer a clear framework of that should be worked on at specific time intervals to be able to properly guide production on what should be done and when it should be done.) Single-Minute Exchange of Die (SEEMED): Yet another is SEEMED, this refers to the changeover time.

Minimizing setup reduces unwanted stoppage of the line; the concept revolves around dividing activities into either internal or external setup. The key is to do as much of the external setups before stopping the line and minimize the internal setups so as to minimize the line stoppage. The key activities for SEEMED are as follows: a) separate the internal setup from the external; b) convert as much as possible of the internal setup to the external setup; and c) eliminate the adjustment process [2]. Cross training of workers and efficient plant layout: When workers are cross trained and maintained sharp, they can cover for any lapses in attendance issues. Moreover, this allows for flexibility, should there be any unexpected problems; they are easily deployed elsewhere in the plant. Boredom and fatigue are reduced on the part of the workers. The exposure to other processes will foster a greater

appreciation of the entire business operations. In addition, the possibility for new idea generation is increased. Also, an efficient plant layout would lead to less transportation, handling, delays, and defects. Total Quality Management (TTS): This should be observed so as to avoid any reworks and recurring issues in the line, it is all about doing things right the first time. The slogan that best describes TTS is " Quality at the source". Any defects encountered will result in delays at the end of the line, so any problems encountered are immediately addressed at its root cause to prevent its recurrence. Moreover, the quality control circles are a small group of workers organized to identify, analyze and solve work-related problems and present their solutions to improve the performance of the organization.

In addition, these groups help in motivating and enriching the work of employees. ' V. DISCUSSION OF RESULTS Prior the conceptualization of lean systems, there were two approaches used by the automobile industries: Craft and Mass Manufacturing. Craft manufacturing focused mainly on providing exactly what customers ask for regardless of the cost and paying little mind to the amount of output. Utilization of highly skilled manpower in designs, machine operations and fittings resulted in high wages. The high cost of direct labor was tolerated due to the limited capability of existing machines of the time.

I have also noted that the system is highly decentralized in its operations and that management Is Touches on ten output AT can Uninominal contributor to ten Tall product. Mass Production, pioneered by Henry Ford, revolves around the philosophy of being able to produce more. This was the environment wherein consumers were willing to buy anything that came out

to market, so it became a key to increase the supply. I believe that this approach was the true solution to what the environment has provided at the time.

Mass production adopted many techniques in order to maximize output, but since he philosophy was solely to increase output, quality was somewhat left by the wayside. One of the major factors that I saw that contributed largely to the achievement of the systems' goal was the use of expensive single-purpose machines. The leadership and management of mass production areas are left to a foreman who manages everything that everyone on the floor does. Minimization of the capabilities of all that were present on the floor became almost impossible with one man monitoring everything.

As for methods of manufacturing, one practice was to reduce huge lot sizes in order to minimize changeovers, which at the time lasted for hours and hours. In this system, reworking is tolerated because the cost of stopping the line to address every single defect was too much compared to the cost of rework and scrapping. Since machines were now doing all the heavy workloads, the shift was made from hiring highly skilled people to Just hiring unskilled to semi-skilled workers that tended to the machines and did minor processes.

This drove the direct labor cost down but only shifted them towards indirect labor. This is due to the fact that mass reduction systems hired many specialist workers to focus on very specific aspects of the production area. These people are needed to sustain the day to day operations due to the unskilled nature of the major workforce. This system maintained a very high

inventory because any line stoppage was too costly. This resulted in higher inventory costs and requiring much more space to store such a large inventory as compared to maintaining Just the right amount of inventory.

During this time, managers measured the system in terms of yield and quality, but since output was the focus, quality took a backseat. The quality of the end products were only ensured not as they are first produced, but rather before they arrive at an inspection facility; so even when defects are produced and identified, they are tolerated to be sent for rework Just to avoid the stoppage of the line. I saw that in this system, reworking is an acceptable part of the process. Lean production system came in last but is still today's recommended approach.

The philosophy is to eliminate wastes in all aspects of production and achieve perfection. This approach took the advantages of both craft and manufacturing systems, while voiding the high cost of the former and the inflexibility of the latter. The key elements which contributed to its success as I have discussed are the concepts of elongation AT moa, J' I Ana ten seven-zeroes AT production. Working on ten continuous improvement of the aforementioned elements brought lean production systems to an even greater height.

The two key organizational features of a lean plant are when the tasks and responsibilities are transferred to those workers actually adding value to the product and where there is a system for detecting defects that quickly traces every problem o its ultimate cause.