Lean Six Sigma Strategy for Manufacturing Process

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ABSTRACT: Despite its popularity, Lean Six Sigma often falls short of expectations. Manufacturers are discovering that having a diagnostic X-ray done up front increases their chances of simplifying processes and reducing expenses. Lean Six Sigma (LSS) has acquired a lot of traction as a technique for increasing industrial productivity and quality. The strategy seeks to assist businesses in creating leaner manufacturing processes and improving product quality. While Lean Six Sigma is great at fixing apparent problems like manufacturing bottlenecks, it struggles to find hidden causes of suffering and identify and size the biggest cost-cutting, waste-reduction, and revenue-generating possibilities. Running every process through Lean Six Sigma is costly and unneeded; understanding where to concentrate before releasing the black belts can make all the difference. While Lean Six Sigma is great at fixing apparent problems like manufacturing bottlenecks, it struggles to find hidden causes of suffering and identify and size the biggest cost-cutting, waste-reduction, and revenue-generating possibilities. Running every process through Lean Six Sigma is costly and unneeded; understanding where to concentrate before releasing the black belts can make all the difference.

KEYWORDS: Lean Six Sigma, Manufacturing Process, Quality Assurance, Six Sigma, X-Ray.

INTRODUCTION

Drilling down even further, we found that in certain instances, deploying big and expensive squads of black belts actually slows down performance improvement attempts. Managers are uncertain how to effectively deploy Lean Six Sigma specialists, and black belts often apply the same strategy to all issues, large and small, leading in ineffective solutions. Furthermore, they fail to prioritize the changes that will have the greatest impact [1]. The X-ray team scans the company and maps its main operations to find the most cost-cutting possibilities by eliminating wasted time and resources [2]. Process performance is evaluated against internal and external standards in order to identify flaws and set improvement goals. When the Lean Six Sigma teams are deployed, the X-ray team evaluates which process changes will produce the best outcomes. Companies release the black belts and begin the conventional five-step Lean Six Sigma DMAIC process—Define, Measure, Analyze, Improve, and Control—on the targeted areas only after the X-ray has revealed the most urgent problems.

An X-ray of an industrial equipment manufacturer's production procedures, for example, revealed three processes that might be improved: welding, painting, and deburring removing rough portions from metal [3]. The business proceeded into the full DMAIC process after identifying these areas and appointing a Lean Six Sigma black belt to lead each project. The Define step, the first in the DMAIC process, in this instance included the black belts taking a step back and determining what needed to be done in the welding, painting, and deburring processes—as well as what portions of those processes they didn't require. In the end, the industrial firm was able to decrease the cost of manufacturing each item by over 15% while also cutting the time it required to manufacture each unit by almost 30%. Consumer Co, a multibillion-dollar consumer goods company, wanted to expand capacity at two of its facilities and decrease overall operating costs to help finance research and roll out a potential new product line [4]. The business added the X-ray stage to decide where to concentrate its efforts, and it paid off: the company easily exceeded its capacity and efficiency objectives. Consumer Co was able to decrease changeover time on a critical packaging equipment from 12 hours to 20 minutes at one facility alone. This innovation, along with other comparable improvements, resulted in a 15%

decrease in package production costs and a 25% increase in capacity [5]. The savings allowed the business to invest in new technology. The X-ray team's initial step is to create a map of the operation's procedures as well as the expenses connected with them. The aim is to figure out what a business does and where inefficiencies or gaps in performance may occur. The X-ray team at Consumer Co started by mapping the business's production process, with the goal of gaining a holistic understanding of what the company was attempting to accomplish in each manufacturing step—and what activities were really being done [6]. The team focused on identifying capacity at each stage, analyzing the connections between the processes, and hypothesizing about bottlenecks and other sources of waste in the process throughout the value stream mapping process. The crew also gathered information from the devices themselves, as well as firsthand observation. That manner, the performance disparities as well as the lost time and material in the process could be seen, and the causes could be broken down: Due to failures, changeover time, or a shortage of raw materials, equipment is not functioning at full speed or at all [7]. The plant finance department assisted the diagnostic team with cost allocation for each key process step.

Some expenses were obvious, such as equipment-operator labor rates, but others required more study. Wasted raw resources, for example, have to be monitored at every stage. The team could identify where the largest expenditures were—and where better performance would provide the most cost reductions the quickest—with the value-stream maps in hand. The objective of the X-second ray's phase is to determine how much performance can be enhanced. The goal of this phase is to define suitable performance-improvement goals by establishing credible external and internal benchmarks for each process. When Consumer Co compared its labor and asset productivity to that of its lowest-cost US rival, it found that it needed to make significant improvements to be competitive. To evaluate the degree to which certain processes were failing, the diagnostic team relied on its members' prior experiences outside of the business [8]. In addition to comparing its performance to these external standards, the business searched for appropriate internal benchmarks inside its own walls. The team, for example, compared the cost of manufacturing a package at the two sites it wanted to enhance to the cost of producing a comparable product at the company's other operations. The exercise not only confirmed what the team previously suspected—that expenses at the two sites were out of control—but it also set realistic goals for change. The team chooses which issues to tackle in which order in this last phase of the X-ray [9]. In a six-week scan of the company, Consumer Co's X-ray team identified 45 prospective performance-improvement projects and rated them according to their ability to provide the largest gain in production at the lowest cost in the shortest period. Initiatives that addressed issues that were common to many processes were given a higher score since they had the ability to enhance numerous processes at the same time. The team eventually narrowed the list down to only six items that would have the most effect [10].

DISCUSSION ON THE APPLICABILITY OF LEAN SIX SIGMA IN MANUFACTURING SECTOR

Initiatives that had less potential or were more difficult to implement were placed in a "parking lot" for future consideration. The team also came up with a second set of ideas that might help generate even more gains, but they would need top management's approval and financial expenditure. After completing the X-ray, the business was ready to use Lean Six Sigma's DMAIC approach to find answers to the most urgent problems. Consumer Co formed six LSS teams with a mix of factory employees and black belts, each tasked with executing a different project. The teams were led by plant employees, with black belts assisting and guiding them, and each had clearly defined objectives and KPIs to help them pursue the potential improvements revealed by the X-ray. In order to validate the X-ray findings, team members made detailed observations of their assigned process steps—for example, that packaging-line downtime was caused by three specific factors: changeovers from one product mix to another, bottlenecks caused by maintenance issues, and line speed driven by product mix. They set out to develop practical alternatives that would help them achieve their performance goals, such as changing the changeover procedure to minimize downtime. The teams were told to test these ideas as soon as possible, then improve them until they were ready to be pushed out to all shifts and other lines with comparable equipment.

Consumer Co's experience shows how, when combined with a diagnostic X-ray, the Lean Six Sigma approach becomes an even more effective instrument. Lean Six Sigma was created to assist businesses simplify manufacturing operations, eliminate waste, and enhance quality. It is currently being used to help organizations accomplish a variety of additional objectives. The four case studies that follow demonstrate the range of Lean Six Sigma's capabilities—and the diagnostic X-potential ray's in assisting in the delivery of outcomes. A large aircraft-parts maker was facing a financial crisis and wanted to free up funds to invest in the company. Due to high expenses and poor inventory turnover, the business was losing out on new contracts. As a consequence, money was being lost. While the aircraft-parts maker recognized the need of increasing inventory turnover, it didn't think it could be accomplished without running out of key components. The company's inventory turnover rate was 2.7x that of its US rival, which was 4x. The poor inventory turnover was only one indication of wider inefficiencies in the management of its component supply, as shown by a diagnostic Xray. The diagnostic team began by sketching out the supply chain's value stream. The business was able to identify the underlying reasons of the rising costs thanks to the mapping. Too many vendors and a big support team are two of the issues. The team then utilized benchmarking to evaluate expenses both inside the company and against industry norms. It revealed that staff headcount and overtime were about twice the industry average in the United States. Then, for each potential change, initiatives were created and ranked based on the cost savings that each might generate. The business intended to utilize Lean Six Sigma to minimize supplier quantities, increase delivery speed, and decrease factory-floor delays. Finally, the diagnostic team assigned metrics to each endeavor, allowing the business to monitor progress against specific milestones. The black belts were only deployed on the targeted regions after that. In two years, the strategy increased inventory turnover by 40%. In the first year alone, it saved approximately $100 million to $175 million. The business was able to save another $20 million by decreasing staff as the supply chain became more efficient. After regaining financial stability, the aircraft-parts maker was able to reinvest almost $200 million in the company to help it restore its competitive advantage. When a worldwide circuit-board maker was purchased, the new private equity owners set lofty financial objectives for the company. To speed up the Lean Six Sigma process, the business chose to do a diagnostic X-ray first, in order to pinpoint the underlying causes of losses and identify which projects would provide the best, and quickest, financial returns. The X-ray team began by mapping global operations' business value streams, spending 12 weeks on the shop floor in each facility, watching production processes and collecting comprehensive data on personnel and other performance metrics. It separated personnel for each step of the circuit-board manufacturing process, enabling the team to understand how labor expenses might be reduced with improved production planning. Unclean environments and crowded, unorganized product processes and workspaces also hampered circuit-board manufacturing, according to the mapping. The X-ray team developed five key initiatives during the prioritization phase to speed up production and lower costs by standardizing steps in the manufacturing process. Employees in every factory would be working toward the same productivity goals if these standardized targets were in place. Some adjustments were as simple as putting cleaning and organization instructions on a bulletin board for workers to follow.

The circuit-board manufacturing became more competitive, efficient, and lucrative as a result of the laser-focused efforts. Over the course of a year, productivity at the US and German factories increased by 24% and 19%, respectively; inventory was cut by more than 55%; and the firm shuttered its UK facility, halting the flow of red ink. The improvements in global operations resulted in a seven-point increase in profits for the new private equity owners. Perhaps more importantly, originally skeptical managers and workers began to believe in the program and began setting aggressive improvement goals for the next year. A large, international equipment manufacturer had attempted but failed to use Lean Six Sigma to combat rapidly rising manufacturing costs. Its black belts had made little headway in improving troublesome assembly procedures. Almost every aspect of the project was over budget and behind schedule. The company spent a lot of money on rush deliveries to meet deadlines, but even then, assemblies were frequently late. As a consequence, the equipment manufacturer's costs were more than twice those of world-class best practices. When starting a new process improvement campaign, the business sought to focus its efforts on the most promising areas. The diagnostic X-ray enabled the business to go from a theoretical to a practical cost-cutting strategy, with the diagnostic team developing a system for finding and evaluating alternatives. Industrial engineers and subject matter experts spent more than 700 hours monitoring plant operations throughout the value stream mapping phase to identify lost time and methods to optimize processes to minimize labor expenses. They toured the factory floor, interviewing shop floor managers and collecting process flow information for each production step, charting the time spent and the resultant productivity, focusing on component fabrication—an area of the facility where components were assembled. The X-ray team was able to benchmark operations and pinpoint the underlying reasons of the manufacturer's rising material and labor expenses thanks to this level of detail. For example, the mapping revealed that one of the main reasons so many components had to be rebuilt was because they were lost or destroyed much too often. The procedure was further delayed by the fact that several components were not manufactured to the correct specs and had to be changed. In addition, the team noticed, recognized, and started to isolate large quantities of non-value-added operations in the manufacturing process. The diagnostic team created benchmarks for improvements by comparing procedures to best practices and tying them to performance measures so they could be tracked.

By balancing anticipated future value against simplicity of execution, the X-ray team selected potential enhancements. The changes that paid off the most in the long run were at the top of the list. Finally, the team developed two tools to assist the black belts be more effective: A Savings Valuation Framework to help select future projects and an Optimal Lean Six Sigma framework to enhance communication and skills while keeping work on track. The firm completed eight process-improvement experiments and deployed successful initiatives with a well-defined action plan in hand, resulting in a 3.5 percent labor reduction. They also developed a repeatable process for finding, assessing, and implementing new projects with yearly savings targets of 3% to 5%. Competitive pressures forced a major electronics manufacturer to innovate faster, more efficiently, and to consistently link its technology research to the company's core market strategy. The firm began on a three-month diagnostic X-ray to speed up innovation and enhance performance, with the goal of eventually revamping ad hoc laboratory procedures and better matching research projects to the requirements of business divisions. Three core research processes were mapped by the X-ray team: how researchers identified technology areas to investigate, allocated resources, and passed technology projects along the R&D pipeline. The investigation included information on how technological ideas were chosen, how projects were staffed at each stage, how academics determined whether to shelve or pursue an invention, and what assistance was given when projects were handed off for development. The mapping assisted the X-ray team in concentrating their benchmarking efforts on internal and external research capabilities. They evaluated each business lab's funding, project prioritization, project mix and quantity, and research methods, particularly time spent researching technological breakthroughs vs technology enhancements. They also looked at typical project timeframes. The X-ray team contacted business division managers to see how frequently researchers chose high-value projects, identifying whether efforts had developed into hot-selling goods or technologies that might be licensed or sold. The lab operations were also compared to industry best practices at the electronics company's main rivals. Three main areas for improvement were identified as a result of the mapping and benchmarking. For starters, many big projects had nothing to do with the electronic manufacturer's main strategic objectives—only 37% of the lab's workers were working on breakthroughs linked to the company's top technological initiatives, for example. Second, the research portfolio wasn't as forward-thinking as lab directors thought; just a fraction of their funds were allocated to five-year breakthroughs. Third, approximately half of the time, lab directors chose ideas based on a "gut sense," rather than a quantitative assessment. The different laboratories were out of sync in general, lacking clear criteria for project selection and consistent procedures to ensure that they received sufficient support as they progressed from ideas to product development. Members of the diagnostic team evaluated each option as they prioritized options, weighing possible increases in research performance against the expense.

Developing a centralized technology strategy with corporate objectives driving research project selection, financing, and resource allocation is at the top of the list of options. The electronics company would better coordinate research resources across laboratories and match projects with both lab and business unit requirements if investment priorities were set at the corporate level. Another high priority is including business units early in the process. That way, researchers wouldn't spend time on unproven theories. The research organization and individual labs would continue to manage projects, but each one would be evaluated against standardized performance benchmarks on a regular basis to determine whether it should proceed. Redefining the lab directors' role to generate more visionary leadership was one of the most important adjustments. Instead of concentrating on daily research, the directors would be global managers tasked with scouring the world for future technological trends and creating cutting-edge technologies quickly. When they saw potential ideas, they led acquisition attempts, saving the business time spent re-inventing technology. Black belts began implementing the strategy and process redesign over the next three months after receiving the completed X-ray. The electronics company was able to quickly innovate in response to market demands once these were in place. The business has boosted its total R&D expenditure, concentrating more on cutting-edge and future technology, thanks to a clearly defined research plan and simplified procedures. Simultaneously, the electronics company is maximizing its R&D expenditures by implementing new efficiencies and exporting certain work to low-cost nations such as India and Korea. After years as the market leader, an industrial supply company's US division found itself losing money and its competitive advantage. The division had fallen from first to third place, and it had not made a profit in five years. The industrial division needed to develop a turnaround strategy quickly because both investors and members of the board of directors were calling for drastic action. But first, the firm had to respond to two questions: Was it reasonable to anticipate more profits? Should the parent firm keep or sell the industrial supplies segment if profitability can't be improved? Management chose to utilize the diagnostic X-ray to create a data-driven study of the division's competitive situation before taking action.

CONCLUSION AND IMPLICATION

In two phases, the diagnostic team addressed the major issues. It matched competitor returns to their market position and then benchmarked their respective costs to produce a fact-based market share study. The team also investigated competitors' capacity expansion plans, conducted interviews with them, and spoke with division employees. Second, it evaluated the division's prospects for investing in a wholesale versus retail channel, which included a customer segmentation analysis, market-share forecasts, and a channel needs assessment. The team was able to develop a road map for cost reductions and select the greatest possibilities for future growth based on the results of the enterprise value stream mapping and benchmarking. They included shutting down the division's costliest facilities and replacing them with units overseas, which would save the company 15% to 20% in expenses. This was a preemptive strike against rivals who hadn't started moving production offshore yet.

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