

# **Implementing Lean Six Sigma Principles in a Non-standardizable Industry: The Case of Springfield Auto Collision**

**Daniel H. Jensen**  
**University of Central Missouri**

**Matthew A. Houseworth**  
**University of Central Missouri**

**Mary S. McCord**  
**University of Central Missouri**

*Entrepreneurs and small businesses would like to benefit from the lean production models they see in larger businesses, but often have non-standardized processes. Unlike larger organizations with specialized tasks, employees of entrepreneurial small businesses perform many different functions, which makes the adoption of Lean Six Sigma methods daunting. Using an auto collision company as a case in point, this paper gives prescriptive processes for Lean production in small, non-standardized workplaces. The case clearly follows the Six Sigma Implementation Framework, but also shows how Phillips and Stone's training model is incorporated as management and workers are trained in Lean Six Sigma.*

## **THE CASE**

Craig Lindquist had entered his family business during a time of crisis. His father Carl, the founder and owner of Springfield Collision, was gravely ill and awaiting a heart transplant. Suddenly, Craig was thrust from his white-collar career into the blue-collar auto body industry that his father had hoped his children would escape. Now, years have passed since Carl's brush with death; Carl was still recovering, and Craig was still managing the business.

Carl's entrepreneurial history started when he founded Springfield Auto Collision in November of 2001. A great 'body man', Carl and his workers provided a variety of automotive collision services including expert frame and unibody repair, parts repair and installation, and an industry-standard water-borne repainting process. The shop serves Springfield, a Midwestern town with population around 19,000 and the surrounding county towns.

For the first 12 years, the business averaged revenues of \$700,000, but never grew beyond that point. Presently, Springfield Auto Collision is a small collision center operating in a 10,000 square-foot facility. It employs 16 individuals, including one General Manager, one Owner, two Customer Service Representatives (CSRs), one Front-Office Estimator, one Parts Specialist, one Production Manager/Expert Repair Planner, five Collision Technicians, two Porters, two Paint Preparation

Specialists, and one Painting Technician. As a team, the professionals at Springfield Auto Collision perform the following collision repair functions:

- Estimation
- Wash
- Meticulous Disassembly
- Action Plan Design
- Parts Procurement
- Action Plan Approval
- Body Repair
- Paint Preparation
- Paint
- Reassembly
- Polish
- Detail
- Customer Delivery and Resale

Craig was frustrated professionally and could see no way to use his MBA education and past executive experience to improve a blue collar business where every car was different and no production process was standardized. Like the rest of the auto body industry, this organization was plagued by ineffective communication procedures, inefficient work and part supply processes, and high turnover rates of critical employees. The company lagged behind industry averages with longer repair cycle time and higher defect rates. All these factors concerned Craig, but it was the unsatisfactory work/life balance for himself and the majority of his employees that became the most motivating factor for implementing change. Craig explained, “It seemed no matter how many hours we put in, we rarely saw any sustained improvement. Our structure was set up in such a way that I didn’t even have time to eat lunch, go to the bathroom, or spend time with my family” (Craig Lindquist, personal communication, September 16, 2016).

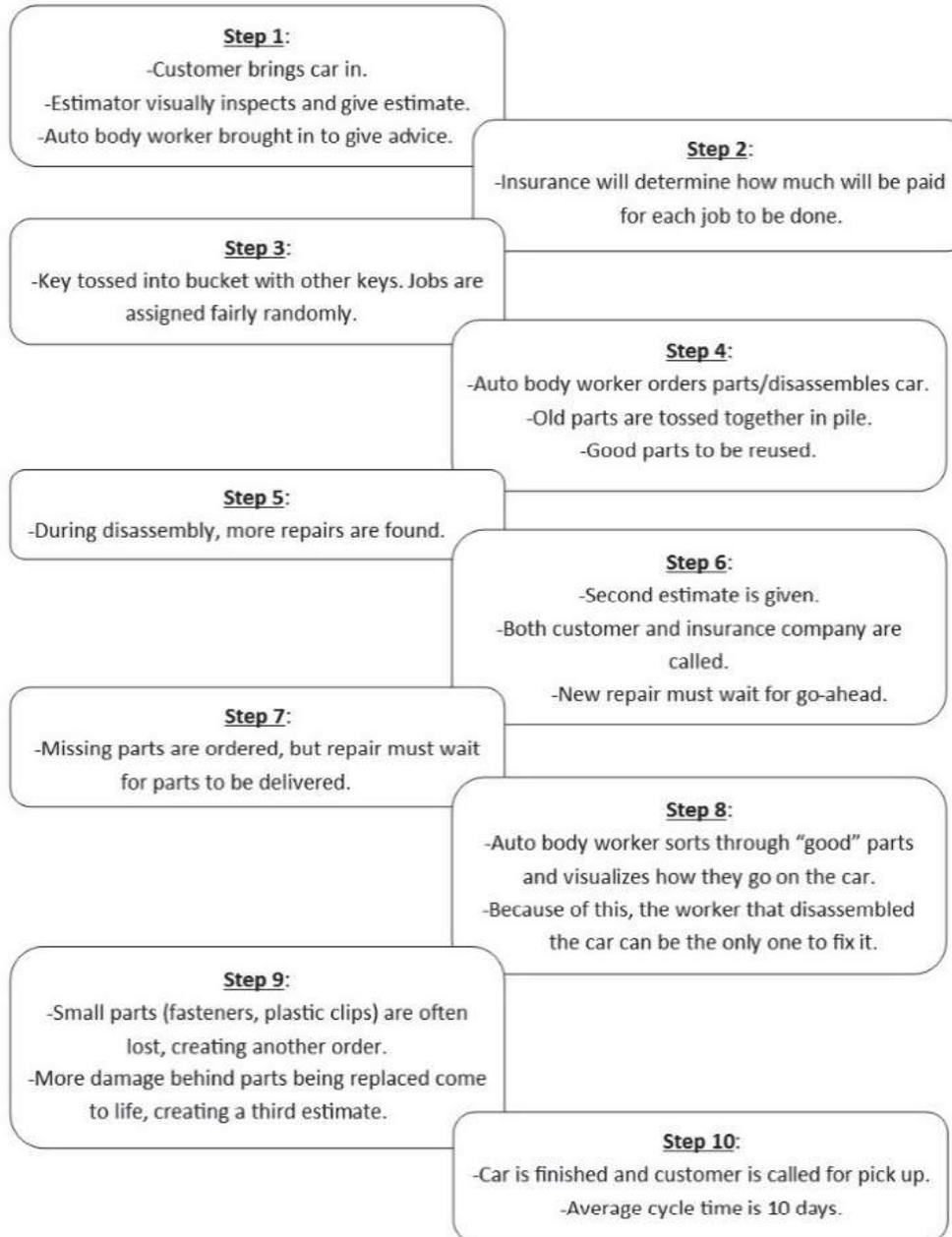
It was at this point that Craig began to question whether or not he should continue in the business: “I had developed a disdain toward the collision industry, and I hated going to work every day” (Craig Lindquist, personal communication, September 16, 2016). He knew something had to change, and he recognized this change had to come from within himself. As he considered his options, Craig had an eye-opening conversation with one of his paint vendors. The vendor suggested he consider implementing Lean Six Sigma or what he referred to as the “Lean Auto Body” process for Springfield Auto Collision. Craig had not only heard of Lean Six Sigma, but he had studied it in his MBA program at a local university. After some consideration and intense research, he was confident that if implemented correctly, Lean Auto Body could work and not only improve the company, but also potentially transform the entire collision repair industry.

Craig wondered, could Lean Six Sigma training and implementation address all of Springfield Collision’s organizational challenges? He considered the following list of problems: 1) Stagnation of Growth within the business which saw relatively flat revenues for a decade; 2) High Employee Turnover Rate which exceeded the industry’s average turnover rate; 3) High Cycle Rate which exceeded the industry average for the amount of time needed to process a vehicle from initial estimation, repair process, to customer delivery; 4) High Defect Rate which exceeded the industry average for breakdowns during the collision repair process; 5) Unsatisfactory/Unsustainable Work-Life Balance for Manager and Employees most of whom were averaging 80 hours of work per week; and 6) Inefficient Communication Procedure/Plan for Managers, Employees, and Customers.

Standardizing the collision repair process is arduous since every car that is serviced requires a different repair. The only constant that Craig could see was that all businesses in this industry had the same problems: high worker turnover, dirty greasy shops, worker tendency to hoard parts and clutter their workspace, wasted time spent looking for lost items, and commission pay structures that did not

encourage quality work. In addition, industry pay practices pitted management against worker, creating distrust between management and workers, contributing to the high worker turnover.

**FIGURE 1**  
**AUTOMOTIVE REPAIR CYCLE**



Commonly in the automobile industry, auto body workers receive 60% of the repair fee as payment for fixing the car. Since this is a commission-based system, if a shop were low on business, auto body workers would begin to seek employment at a different shop. If they needed a bigger paycheck, they were tempted to skimp on quality in order to move cars through the repair cycle faster, thereby increasing their ability to work on more vehicles. On the other hand, managers at a collision repair center are

compensated with annual salaries. Distrust arises between these two groups because managers are responsible for attracting the customers who ultimately provide the capital to pay the body workers. If the shop does not have enough customers, the workers begin blaming the managers. Conversely, management can distrust the quality of the repairs, leading to micromanagement of employees.

Distrust between management and line workers created high barriers to adopting the Lean Six Sigma approach or any cultural change. In addition, organizational trust, culture issues, and the non-standard nature of auto repair blinded managers to the possibilities of Lean Six Sigma process improvement. The auto repair process before implementing Lean Six Sigma is outlined in Figure 1. This case reports Springfield Auto Collision's progress stemming from the implementation of Lean Six Sigma over a four-year period. In order to achieve successful outcomes and return on investment at Springfield Auto Collision, trust building, Six Sigma Lean processes, and training had to be integrated.

### **Leadership**

Craig Lindquist was established as the leader of Springfield Auto Collision, in some ways, by default. As Carl's health was in life-threatening decline, Craig temporarily stepped in to run the operation until a long-term solution could be determined. His MBA and business experience made him the logical choice in the interim. Following a successful heart transplant, Carl returned to work a new man with a new outlook on life. He realized that he no longer wanted the stress of managing the business; instead, he simply wanted to do what he loved – work on cars. This left Craig with a choice to make: find someone else to manage the business or fully commit to leading the organization. Craig decided to step up to the leadership challenge. However, Craig had a few hurdles to jump before he could introduce a radical change like the implementation of Lean Six Sigma process at Springfield Auto Collision – hurdles that would take more than a decade to navigate.

### **Customer Focus**

In the collision repair industry, especially in a small town, customers are at the mercy of the technicians working on their vehicles and the insurance companies that will foot the bill. Because there is so little competition, Craig had not needed to value customer satisfaction and could tolerate delays in the repair cycle or rework that was sometimes required.

### **Measurement & Process and People Management**

Craig's employees had years, in fact decades, of experience in the industry, while he was a novice. His suggestions about moving towards a more efficient, team-based operation were met with disdain. "We talked about teams back in the 80s. They don't work," quipped Carl. "Did you try them back then? Had anyone actually worked on a team?" asked Craig. "Nah. Ah, well, I don't think I worked with anybody who was on a team. I just heard about it from Bill" (Craig Lindquist, personal communication, September 16, 2016). So Craig went to Bill to find out more. The business's use of teams turned out to be a secondhand rumor with no basis in reality. Craig realized that he would need to get more credible information and share it with his workers, but he would need to proceed with caution. He knew that their resistance to improvements would counteract any change initiative.

### **Automotive Collision Repair Industry**

#### *Industry Norms*

The automotive industry has its own well-established sets of expectations and codes of conduct: "Whenever we have a problem, we throw stuff across the room, or go outside and fight it out, or shout, 'To heck with you – I'm leaving'" (Craig Lindquist, personal communication, September 16, 2016). Therefore, Craig knew making changes would involve changing the culture as well as practice. The typical attitude was, "I'm just here to fix cars. I'm not here to come together as a team. That team stuff will just chew up hours ... I've worked at twenty different body shops in the last twenty years. I don't

want to settle in. I need to look out for myself." These unyielding attitudes defined the auto body workers' definition of self. They were well entrenched, and Craig questioned whether they could be altered.

After eight years of pressure, long hours of work, and rare opportunities to get away, Craig had had enough. "It started at the end of 2011 with me getting ticked off enough to decide to make some changes. I recognized that I just wasn't happy in this industry – so some things were going to have to change. Either I was going to leave the industry, or we were going to change our operations...change the industry...be a model for the industry. That was the turning point for me. I decided to stay; I looked in the mirror and said, 'You know what, you are the problem right now, and you need to be all in.' I needed to quit complaining and whining about it and figure out what I could do to fix the situation!" (Craig Lindquist, personal communication, September 16, 2016). The bottom line: the change would need to start with him, but it wouldn't be good enough for him to recognize the possibility for change and simply come back to tell his employees. He wanted them to see the potential for change; they needed to believe in it, too.

### *Making a Case for Change*

In order to move forward, Craig had to gain support from his father, as well as his other employees. As the owner of Springfield Auto Collision, Carl Lindquist would need to be convinced that an investment in a Lean Six Sigma process could work. Craig shared, "Dad may not be the most agreeable person in the shop. He can be very outspoken about what he feels and believes. On the one hand, it's good because you know his position, but he can be tough to manage sometimes" (Craig Lindquist, personal communication, September 16, 2016). However, something shifted for Carl when he saw his son's commitment to change and once he learned that Lean Six Sigma was being applied successfully in other auto body shops. "It's the joke now. Dad learned so much, that now you would think it was his idea in the first place! It's been hard, but the family is still together and he and I have a good relationship – a better relationship than before" (Craig Lindquist, personal communication, September 16, 2016).

Craig began looking for specific tools to make things better. In conversations with his automotive paint supplier, they recommended that he and his team attend 'Lean for Collision: Green Belt' training, a four-day introduction to lean principles specifically for their industry. Craig remembered, "At that point, my eyes were opened to the fact that you could apply Lean. Maybe what I had learned in college could actually be applied in industry!" While he knew that training like this was going to be necessary, he also knew it was going to be expensive.

In spite of the cost, Craig decided to make the investment in Green Belt training designed specifically for the auto collision repair industry. As he put it, he "saw the light" when he realized that "big no longer beats small" and that slowing down would allow the organization to go faster. But he was up against the mindset and attitudes of a highly entrenched workforce that considered all of that "Deming bunk" to be irrelevant. Craig reflected on his belief at the time, "You can't apply it to the car industry. These are men. They work with their hands. They don't know this touchy-feely stuff coming out of the University. They don't want stupid icebreakers or to go on retreats. Give me a break." (Craig Lindquist, personal communication, September 16, 2016). Even though this training would run counter to his employee's values, Craig knew that it was necessary for the success of the business.

### **Training Implementation**

While most businesses might send a select number of representatives from different areas of the business for training, Craig sent everyone (managers, estimators, body techs, painters, and the company secretary). Fees per person for the training were \$2,500, plus expenses for transportation, hotel accommodations, and not to mention their hourly pay while attending the training. This was a major investment for a struggling small business, but the impact was substantial.

Upon returning to Springfield, Craig closed the shop for one afternoon, and the entire team met together to lay out the case for change. They reviewed their feedback from the training, and collectively made the decision to implement Lean. "Let's do it! Let's try it!" (Craig Lindquist, personal communication, September 16, 2016), and that's what they did.

Craig found a shop that was implementing the Lean Six Sigma team concept and took all of his employees on a field trip. Craig rented a 15 passenger van, everybody jumped in, and the team headed to nearby Jackson and took a tour of Cooper's Auto Body. "Wow, this place is cool!" It's like the Taj Mahal!" "This is great!" were only a few of the comments from the Springfield workers. Mr. Cooper was a gracious host to the employees, and he allowed them free range of the shop to ask his employees "what they like, what they don't like, what works, what doesn't work" regarding Lean and the collision automotive industry.

In the week following the team's return from their visit to Cooper's Auto Body, Craig hired a Lean Six Sigma consultant to help them implement the new systems and processes they had been studying. The employees debriefed on what they had learned in their training as well as the site visit, allowing for an open and honest discussion about what they thought would and would not work. Craig's team was struck by the atmosphere at Cooper's Auto Body. "They all seemed happy...low stress. They said when they go home at night, they don't have to worry about work. As soon as they leave, they just leave. Work stays at the door. I don't see the downside." Since workers at Springfield felt an inordinate amount of daily stress, shifting toward this type of relaxing environment was one of their top priorities.

With high levels of enthusiasm, Craig and the Springfield Auto Collision team began implementing Lean Six Sigma. They outlined their change initiative under the guidance of their Lean consultant. The pilot program initiated isolated, small-scale changes across time. Using the 5S Workplace Organization principles, the team identified key performance metrics and designed a visual control system for the collision center as a starting point for improving throughput performance and productivity.

Following a series of rapid improvement workshops (called "Kaizen Events") conducted by their Lean consultant, Craig felt it was time to implement a large-scale change that would involve multiple people and processes. In order to eliminate production waste, the shop began implementing the X-Ray Repair Planning™ and X-Ray Estimating™ methodologies (MVP Business Solutions, n.d.). These included visual mapping to identify authorized repairs, meticulous disassembly of the vehicle and discovery of hidden damage, procurement of required parts, pre-repair activities, scheduling the vehicle for repair, and verifying quality of the repair.

In the past, if a technician were preparing a vehicle for a scheduled pick-up by the customer and discovered a missing or broken part, he or she would implement a quick fix which usually overused materials and cost the business money. However, when applying Lean principles, each vehicle has a complete "kit" of the specific parts necessary to complete the repair in its entirety. Craig shared the improvement, "We have made it easier for the technicians and the shop is now getting paid because we are sourcing everything up front and billing to insurance. For example, we've got a little baggie that says 'Lower Bumper Retainer', another that says 'Outer Side Retainer', etc., and I take all of these little baggies and I put it in one big baggie that says, 'Front Bumper'. Now I've got a 'Front Bumper Kit' and I can literally hand this kit to anybody and say, 'Build this bumper'." Best practices like these enable any technician to perform the repair and reassembly regardless of who performed the disassembly tasks.

In order to effectively communicate across all departments in the shop, Craig invested in a web-based customer relationship management (CRM) system that would allow everyone on the team to have real-time access to information about customers, their insurance companies, repair estimates, scheduling, and additional tools to help make the shop more efficient. Every employee was trained on the use of the system, and large screen televisions were hung where anyone could log-in to the system and see the details of the work being completed. Along with these large monitors, dry-erase white boards with daily goals and accomplishments were hung around the shop to immediately communicate the production schedule and performance metrics (like cycle time to complete a car, number of cars completed for the day, etc.).

### **Updated Process**

Progress was being made, and Craig could see the results simply by looking around the shop, not to mention by looking at the bank account. Customer traffic was increasing and revenues were climbing rapidly. While the Kaizen Events were held occasionally for the initial period of implementation, Craig

realized that he needed to add in a more consistent and integrated opportunity to provide training to the entire team. He started with himself and made a commitment to finding “2-minute improvements” every day. To prove the point, he recorded himself in a YouTube video putting Lean Six Sigma processes to work in his own office! This launched a daily training event, called “Morning Meeting.”

The work day at Springfield Auto Collision starts at 7:30 a.m. When the team arrives, they are not allowed to touch a car until after the Morning Meeting. Craig explained, “We give everyone about an hour to make an improvement which could be anything from sweeping, to cleaning, to making a process improvement. Then we come together as a group, share our ideas, and go through the scoreboards. We also learn something new during the meeting. We finish by presenting the production plan and sharing any good news that we have. Then we go fix cars. It’s usually an hour and a half every day.” (“Craig Lindquist”, personal communication, September 16, 2016).

For the first 18 months, Craig ran the Morning Meeting as its lead trainer. He would drill the team on the 5S’s and the 8 Types of Waste, talk about past performance metrics and goals for the day, and highlight the production schedule and job assignments.

Craig was proud of the way the team had rallied around their Lean Collision transformation, and their willingness to share their successes and set-backs with one another in a transparent way. The employees created their own system of reviewing their performance on a daily basis with the Morning Meetings. He explained, “Our sales board is basically a front office estimator sales board. Then we have a production scoreboard which is basically everything in the shop. We have a daily scoreboard that we do for the paint department so they know whether they are ‘winning or losing’ in terms of whole jobs being completed. It’s when the car goes home. That’s the whole job.” (Craig Lindquist, personal communication, September 16, 2016).

Beyond production metrics, the team also began to focus on cross-functional development. To enhance their team model, each member of the team cross-trained on a range of business processes – not just their own job, but the jobs of others. Then they created an evaluation of proficiency in each of the areas: ‘beginner’ if they are new, ‘novice’ if they can apply, and ‘expert’ if they can train others. Craig then provides feedback on where each member of the team is rated. This also gets posted on the company scoreboard for everyone to see.

Springfield Auto Collision faced some challenges in implementing their Lean Collision methods, but Craig eventually got enough buy-in and support to fully implement. After 18 months of Craig leading the daily Morning Meeting sessions, he realized that the team was ready to begin leading the sessions themselves. They created a rotating leadership roster where everyone on the team would take the responsibility for facilitating the entire session. Each was responsible for researching and posting scoreboard numbers. At this point, the team was completely behind the initiative. Craig reflected, “If I went back to the team and said, ‘There’s no Morning Meeting today.’ They’d go, ‘What the heck? We can’t work without Morning Meeting!’ When before it was like, ‘We ain’t got time for a morning meeting. I feel like I should be fixing a car.’ Now, if I’m not there, the Morning Meeting still happens. It’s all about repetition” (Craig Lindquist, personal communication, September 16, 2016).

Thanks to their Green Belt and Kaizen training, the concept of the “2-second improvements” had become a part of each employee’s daily life. The 45 minutes prior to the Morning Meeting were dedicated to finding waste and eliminating it. Craig shared countless examples of what each employee had come up with. One technician converted a rolling toolbox into a personally customized tool management system complete with Kanban foam organizers where only the correct tool would fit in its assigned slot. A customer service specialist created a “tickler” system to remind them to contact customers proactively about scheduling their vehicle for service. One employee redesigned the company break room; everything has a place and everything stayed in place because of strategically located magnets. Even the salt and pepper shakers were magnetized to the table, so they could never be misplaced!

Craig remembered, “They pull all of the data and not me; that’s why we taught them how to use the management system...not just to write estimates, how to take pictures, how to document the file, to see if the parts are here or not...but to create spreadsheets, decipher that information from a spreadsheet, transfer it to our visual scoreboard that’s handwritten. They actually hand-write it on the board. They

hand-write it, because they ‘connect’ to the information...they ‘feel’ it. ‘Are we winning? Are we losing?’ Then they present it to the team as they lead our morning meeting.” One of his goals was to develop the individuals on the team as leaders – not just technicians. “You’re going to learn how to run a meeting. Keep people on task. Lead a discussion. Pull scoreboards. Interpret the data like a manager would. They’re doing all that. It’s no longer about me; it’s all about them.” (“Craig Lindquist”, personal communication, September 16, 2016).

## **TEACHER’S NOTE**

### **Introduction**

This undergraduate case addresses two practices that are not normally part of the entrepreneurial domain. First, prescriptive practices for adopting Lean Six Sigma tools in a nonstandard entrepreneurial environment are explained. These practices are further illustrated by the case. Second, the discussion questions raise the issue of computing Return on Investment (ROI), a practice rarely performed by entrepreneurs, and almost never performed in family businesses. Theoretically, entrepreneurial research is furthered through the alignment of Kumar, Antony and Tiwari’s Six Sigma Implementation Framework (2011) with Phillips and Stone’s training model (2000) as a prescription to train management and workers in Lean Six Sigma.

### **Implementation of Lean Six Sigma**

Entrepreneurs and small businesses often have non-standardized processes and would like to benefit from the lean production models they see in larger businesses. But, for various reasons, the lean six sigma production literature proposes models that don’t apply to entrepreneurs with small to medium businesses. Some lean models assume that businesses already have data collection systems, some models weren’t operationalized and therefore couldn’t be implemented, and others didn’t take into account the resource constraints of small businesses (Kumar, Antony & Tiwari, 2011). Since most Six Sigma research had no suggestions on how to operationalize or implement the model being proposed, there was little practical benefit of Lean methods to entrepreneurs.

In practice, entrepreneurs struggle when attempting to implement Lean approaches. Antony (2008) reasoned 1) the entrepreneur has many distractions in their business and may not stay focused, 2) unlike larger organizations with specialized tasks, employees of entrepreneurial small businesses perform many different functions, and 3) senior management leadership is important, but entrepreneurs are usually focused on fighting fires involving easy-to-accomplish tasks or easy-to-solve problems. Another study (Kumar & Antony, 2008) found that the barrier to adopting lean techniques lies with senior management, which for entrepreneurs is often the owner. They believe that their culture and existing systems are sufficient, that Lean can’t apply to them, and that these processes are a fad which will quickly pass on. On the other hand, Rose, Deros, Rahman, and Nordin (2011) found some advantages for small companies implementing lean processes; 1) they are more agile, and 2) it is easier to get management support and commitment.

### **Trust and Organizational Change**

Moving any business of any size from the processes outlined above to a Lean Six Sigma workplace requires large-scale change. This means altering work systems, beliefs, social relationships and culture (Huy, 2001), and each element of change requires some intervention. As a matter of normal behavior, - people and systems are resistant to change in their status quo. Lewin (1951, pg. 872-877) proposed that unfreezing the status quo to allow change required either strengthening the drivers, weakening the barriers, or both. The most effective method was weakening the barriers to change in behavioral, cognitive, and emotional responses. Also, management would not want to force change, since an adversarial approach only strengthens the barriers to that change and leads to failure.

### **Lean Six Sigma Terms and Definitions**

Many terms are used interchangeably or together to describe lean production processes. That is because most businesses are pursuing a strategy of Total Quality Control, and are using the tools and methods called Six Sigma, Lean Production, Theory of Constraints (TOC), and Just-in-Time (JIT) simultaneously (Stamm, Neitzert, & Singh, 2009). There are differences in the methods according to their focus. Two of the techniques, Lean Production and Six Sigma, have been combined into a method called Lean Six Sigma. It is this method that was adopted by Springfield Auto Collision.

#### *Lean Production*

Lean Production is a systemic way of removing waste (Womack, Jones & Roos; 1990). It incorporates two tools: Just-in-Time and autonomation. Just-in-Time means ensuring the right parts reach the worker just as they are needed. Autonomation refers to intelligent automation, where the machine: 1) detects process malfunctions or product defects, 2) stops itself, and 3) alerts the operator.

#### *Six Sigma*

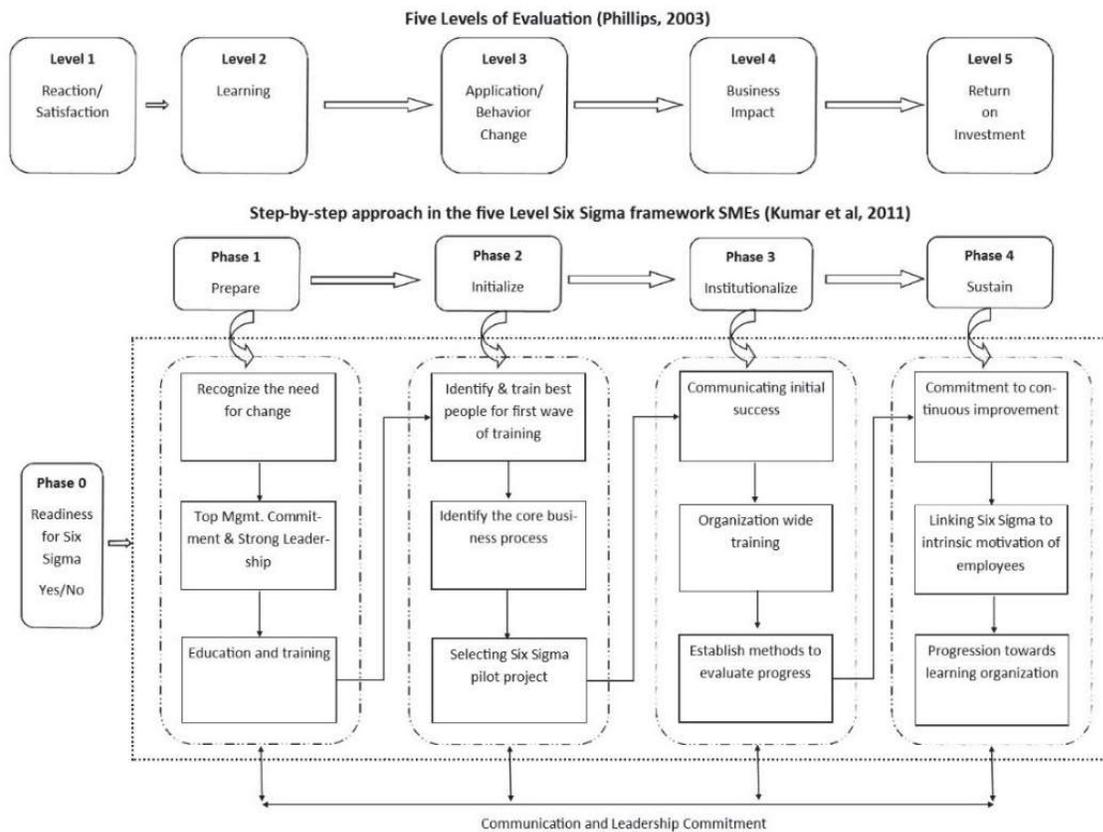
Six Sigma has a hierarchy of expertise, (Master Black Belt, Black Belt, and Green Belt) and uses a change in management methods to reduce variation. An important part of Six Sigma is training of managers and workers into thinking about processes and continual improvement. It has four major steps: Measure, Analyze, Improve, and Control.

#### *5S*

For implementing Lean Six Sigma methods in a shop or business, workers use the mnemonic “5S” for sort, set in order, shine, standardize and sustain.

An additional strength of this teaching case is that it shows students how two theoretical models can be combined. Figure 2 shows how Phillips and Stone’s (2000) training model and Kumar et.al.’s Six Sigma Implementation Framework (2011) overlap and support each other. This combination strengthens explanatory and prescriptive power. As the case follows the sequential steps of the Six Sigma Implementation Framework, it also shows how Phillip’s training model was followed as management and workers were trained in Lean Six Sigma. The two models are combined in Figure 2.

**FIGURE 2**  
**INTEGRATION OF LEAN SIX SIGMA IMPLEMENTATION AND 5 STEPS OF TRAINING**



Across the top of the model in Figure 2 are five phases of training (Phillips & Stone; 2000) which align sequentially with the five phases of Six Sigma Implementation. A workforce begins with the first training level: “Reaction/Satisfaction Objectives, which corresponds to Phase 0 of Six Sigma Implementation model: ‘Readiness for Six Sigma’. As the workforce moves to ‘prepare’ for Six Sigma Implementation, they set training objectives at the ‘learning level’. As a workforce initializes Six Sigma, they train for ‘application and behavior change’. With that level of success, a workforce can move to ‘institutionalize’ Six Sigma Lean processes, using training objectives focused on ‘Business Impact’. Finally, Six Sigma implementation is sustained, and training’s return on investment is measured. Further explanation of Phillip and Stone’s (2000) training phases show how closely they can be aligned with the training required for Six Sigma implementation.

**Phillips and Stone: 5 Levels of Training**

*Level 1: Reaction/ Satisfaction Objectives*

According to the authors, this particular level’s focus is on participants reacting positively, not negatively, to the activities associated with training (Phillips & Stone, 2000). During this level, “it is important to obtain feedback on the relevance, timeliness, thoroughness, and delivery aspects of training” (p. 39). In addition, the data associated with this level should be routinely collected in order to facilitate adjustments, or even a redesign of the training program.

### *Level 2: Learning Objectives*

Phillips and Stone (2000) state that the learning objectives associated with Level 2 “are critical to measuring learning because they communicate the expected outcomes from the training and define the desired competence or performance necessary to make the training successful” (p. 39). In addition, not only do learning objectives emphasize what participants must learn during training, but also provide a framework to evaluate their learning. Measuring learning and communicating expected outcomes encompasses the first three steps of Kumar et.al.’s (2011) model: 1) recognize the need for change, 2) show top management commitment (outcome expectations), and 3) education and training.

### *Level 3: Application/Implementation Objectives*

According to Phillips and Stone (2000), application/ implementation objectives of Level 3 “define what is expected and often what level of performance, when knowledge and skills learned in the training are actually applied in the work setting” (p. 39). While similar to learning objectives in Level 2, application/ implementation objectives “reflect actual use on the job”. They assert application/ implementation objectives are critical to the training process in that they illustrate outcomes in the “intermediate area between the learning of new knowledge, skills, tasks, or procedures and the performance that improved” (p. 39). These objectives also provide a framework for evaluation of “on-the-job changes and performance”. This phase of training is used to identify the best processes for a pilot study and train the champions of change.

### *Level 4: Impact Objectives*

Phillips and Stone (2000) note impact objectives at Level 4 include “key business measures that should be improved when training is applied in the work setting” (p. 42). According to the authors, impact objectives are critical to “measuring business performance” due to the fact these objectives “define the expected outcome of the training” (Phillips & Stone, 2002, p. 42). These objectives illustrate business-unit performance that should be associated with the training initiative. In addition, impact objectives provide a framework for measuring the effects of “the application of skills and knowledge learned” during training (p. 42). At this point in Kumar et. al.’s (2011) model, the first metrics of increased performance are being communicated before organization wide training.

### *Level 5: Return-On-Investment (ROI) Objectives*

According to Phillips and Stone (2000), the fifth and final level of objectives includes the “expected return on investment” from training activities (p. 44). The authors note that at this level, ROI objectives “define the expected payoff from the training and compare the input resources, as well as the cost of training, with the value of the ultimate outcome-the monetary benefits” (p. 44). For example, if a return of investment is 0%, then the training program is considered a solution if it breaks even. On the other hand, a return of investment of 50% indicates the “cost of training is recaptured and an additional 50% in earnings” is realized (2000, p. 44). Simultaneously, Kumar et. al.’s (2011) model shows that once ROI is established, the processes learned are sustained, employee motivation is linked to improvements, and the organization culture is changed to a learning organization.

### **Quantifiable and Useful Objectives**

Among the various training objectives discussed above, impact and return on investment (ROI) objectives tend to be the most quantifiable in terms of the type of data that is collected at each level. For example, impact objectives are associated with measuring both hard data (output, quality, costs, and time) and soft data (customer service, work climate, and work habits) (Phillips & Stone, 2000, p. 43). Impact objectives can “define the expected outcomes” from training and “measure the consequences of the application of skills and knowledge learned through training activities” (p. 42). ROI objectives, on the other hand, define the expected payoff from the training activities. In addition, ROI objectives compare input resources, as well as the cost of training with the value of the outcome associated with the training initiative (p. 44).

## **The Six Sigma Implementation Framework**

In an attempt to give entrepreneurial and small businesses a model of Lean Six Sigma that could be implemented, Kumar et. al. (2011) identified ten small businesses going through the process. They found five major phases of implementation: 0) Readiness for Six Sigma, 1) Prepare, 2) Initialize, 3) Institutionalize, and 4) Sustain. The first phase is numbered zero, rather than one, because many small businesses can't decide where to begin and never get started. Inside each of the remaining 4 phases, Kumar et. al. (2011) have identified three steps, resulting in a twelve step model. Below, each phase and step is explained. Our case study describes how the entrepreneur progressed through the model, step by step.

### *Phase 0 – Readiness for Six Sigma*

Previous researchers have studied the preparedness of the business to adopt lean techniques and from these studies Kumar et. al. (2011) created a readiness index. The business should be at least a '3' on a 4 point Likert scale to consider going forward with adoption of lean standards. The five criteria to measure a small business's readiness to implement Lean Six Sigma were identified as: 1) Leadership, 2) Customer focus, 3) Measurement and Process, 4) Systems and Control, and 5) People Management. All are equally important when assessing whether a business was ready to implement six sigma. It is suggested that only small businesses that achieve a minimum of 3 on all criteria should embark on Lean Six Sigma practices (Kumar and Antony, 2010).

### *Phase 1 – Prepare*

In Phase one, the steps help a small business understand the rationale behind the change. It also measures the commitment from the entrepreneur(s) to invest resources into the change.

*Step 1:* Recognize the need for change. The entrepreneur identifies his/her need for Six Sigma, and justifies a launch of lean methods. External elements such as customers and vendors can create a need for change, as well as internal elements such as employees, equipment or management. These may be intertwined. In our case, the entrepreneur himself identified a need for change arising from his quality of work/life balance.

*Step 2:* Strong leadership and top management commitment. Entrepreneurs are at an advantage during this step, since they usually are the top management, and the leadership consists of few people. Little time is spent gaining consensus or commitment from a large group of people. Their level of commitment drives the commitment of the program, which works best from the top down. At this point the entrepreneur defines the purpose (outcomes) and scope (entire business) of Lean Six Sigma, and links it to the mission and vision of their business.

*Step 3:* Education and training at the senior management level. Training must start with the entrepreneur at the top of the organization, and waterfall down the ranks. In entrepreneurial businesses, the organizational structure is usually flat, meaning knowledge transfer can happen quickly. Entrepreneurs have an advantage in that they don't need a Six Sigma 'steering committee' or need to choose change champions. On the other hand, Step 3 is where resource constraints usually stop entrepreneurial small businesses from moving forward. The entrepreneur must commit to time, financial resources, technical investments, and other resources to train their upper management.

### *Phase 2 – Initiate*

In Phase 2, upper management begins to implement the change on a pilot basis. The literature (Kumar et. al., 2011) suggests beginning with a few selected and motivated employees. For entrepreneurs with a small workforce, it may make sense to start with a pilot process.

*Step 4:* Identify and train the best people for the first wave of Six Sigma. For most businesses, this step is where they find the best, most talented employees with good leadership skills to be part of the first wave of training on Lean Six Sigma. For small entrepreneurial businesses, it is suggested that they conserve resources and avoid the Master Black Belt and Black Belt training costs of their first wave of

employees. The complexity of small businesses' problems are not as great as a large business. In practice, one Black Belt can be used to train the other employees, and not all employees need a Black Belt level.

*Step 5:* Identify the core business processes. In this step the entrepreneur identifies the core processes and prioritizes those that are critical (that have greater stakeholder or financial value). They develop a process map or value stream map, then a measurement plan and metrics for the core processes. Once the metrics are established, they review the current performance of the critical processes and create benchmarks for them.

*Step 6:* Selecting Six Sigma pilot processes. Initial pilot programs should focus on key problem areas for which an early win is possible. This increases buy-in and commitment to the Six Sigma initiative.

### *Phase 3 – Institutionalize*

The entrepreneur implements Lean Six Sigma across all employees and processes. Here the entrepreneur creates a business culture of process and statistical thinking, and continuous improvement becomes embedded in the business.

*Step 7:* Communicate the initial success. The entrepreneur should communicate to everyone the success of changes – using metrics from step 5. Employees engaged in Six Sigma success are recognized. Suggestions include: celebrate success of pilot projects, recognize and appreciate top management and supervisors, and share challenges and pitfalls.

*Step 8:* Organization-wide training. In Step 4, it was suggested that rather than train several employees as Black Belts, just one employee be trained for the purpose of training others. During this step, all the training needs are identified, and an ongoing system of training is put in place. Then, the Black Belt trains the rest of the employees to the level needed. Continual training should not only focus on statistics and techniques, but include 'soft' skills such as change management, leadership, and culture.

*Step 9:* Establish methods for evaluating progress. The metrics and measurement methods identified in Step 5 now become a standard procedure/system for recording and reporting results. This reporting includes successful as well as poor results to all employees. Members of a supervisory team, not the entrepreneur, are responsible for reporting results in their individual areas. It is suggested that the entrepreneur establish a monthly review of on-going projects, performance trends, progress reports and then revise strategies.

### *Phase 4 – Sustain*

At this point the entrepreneur should be pursuing steps that spread the knowledge acquired so far across the entire organization. For an entrepreneurial small business, this may have been happening during the previous steps, if the pilot group of employees is actually the entire company.

*Step 10:* Commitment to continuous improvement. The challenge to the entrepreneur during this step is that they continue their commitment in the face of business challenges or declines in the economy. Entrepreneurs that can do so should create a generation of managers committed to the Lean Six Sigma.

*Step 11:* Linking Six Sigma to intrinsic motivation of employees. Employees now become the source of ideas and innovation. Their knowledge and expertise are harnessed to implement new Lean processes. The employees are empowered for improving processes, continue training and development, and are given rewards and recognition.

*Step 12:* Progression towards learning organization. There are regular project meetings to enable management and employees to share experiences and progress on projects. These increase individual and organizational learning, and give regular review of training needs.

## **DISCUSSION QUESTIONS**

### **Discussion Question 1**

Springfield Auto Collision currently has \$700,000 in revenues, and would have to spend over \$50,000 up front to get Lean Six Sigma training for Craig and his team, plus an additional \$260,000 to

continue implementation across the three coming years. If you were Craig, would you commit to Lean Six Sigma and spend this money? Why or why not?

#### *Notes on Question 1*

The following four responses explore varied perspectives addressing the question: If you were Craig, would you commit 100% and spend \$310,000?

*Answer 1:* No. Craig's employees feel Deming to be irrelevant. Craig should listen to this advice. This opinion is supported by research (Kumar & Antony, 2008) which found that the barrier to adopting lean techniques lies with senior management, which for entrepreneurs is often also the owner. Entrepreneurs believe that their culture and existing systems are sufficient, that lean processes can't apply to them, and that these processes are a fad which will quickly pass on.

*Answer 2:* No. There is little history of success for Lean Six Sigma for entrepreneurs. Research cited from the case said that past research had found little practical benefit of Lean Six Sigma to entrepreneurs (Kumar, Antony and Tiwari, 2011). In addition, Springfield Auto Collision has all 3 components for failure of implementation as identified by Antony (2008). The first is that the "entrepreneur has many distractions in their business and may not stay focused." Craig and his father have so many distractions, they can't even go to the bathroom or go to lunch together. Craig is constantly interrupted for employee guidance. The second reason from Antony is that "unlike larger organizations with specialized tasks, employees of entrepreneurial small businesses perform many different functions." This is perhaps the major reason Springfield Auto Collision should not adopt a Lean Six Sigma culture/management method. The auto collision repair business lacks specialized, repeated production tasks that can be streamlined. Thirdly, Antony says "senior management leadership is important, but entrepreneurs are usually focused on fighting fires involving easy-to-accomplish tasks or easy-to-solve problems." Again, Springfield Auto Collision management, Craig and his father, are constantly distracted and fighting fires. They cannot focus on a large managerial change while simultaneously keeping the daily operations functioning. Springfield Auto Collision is small and doesn't have the resources of time or money to implement Six Sigma Lean.

*Answer 3:* Yes. Craig is unhappy as a manager of an unmotivated workforce. This has become a personal, rather than business decision. Therefore, it is emotionally necessary if Craig is to continue in the family business.

*Answer 4:* Yes. Craig has an MBA, and is familiar with the advantages Six Sigma Lean can bring. He is willing and able to be trained. Since he is willing to commit 100%, he should go for it. Rose, Deros, Rahman, and Nordin (2011) found some advantages for small companies implementing lean processes; 1) they are more agile, and 2) it is easier to get management support and commitment. Since "management" is Craig and his father, and his father is willing to try the new approach, Springfield Auto Collision has the necessary support and commitment. Also, Craig can be flexible and tailor the rollout of Six Sigma Lean training and implementation to his own small company. Large corporations don't have this agility, and have to work hard to get the method adopted throughout the company.

#### **Discussion Question 2**

Would you commit to all of the costs in Table 1, or would you commit to parts of it over time? If you choose to implement Lean Six Sigma over time, which elements of training should Craig choose to do first? Why? Prescribe an implementation plan below. If you feel all elements should be implemented at once, then include them all in the "Elements done first" section. (See Table 1 for breakdown of the budget for Lean Six Sigma adoption.)

#### *Notes on Question 2*

In most adoptions of Six Sigma Lean methods, all employees are not sent for training all at once. Even in smaller firms, the roll-out of a Six Sigma Lean plan is done gradually. Management training should always be done first, then a champion worker should be trained, and they can then train others. Your students may choose to delay training some of the employees.

Lean Six Sigma training costs are shown in Table 1. Revenues over the time of Lean Six Sigma implementation are shown in Table 2. Using these figures, determine the ROI. Return on Investment can include any benefit from the program. Net Benefit = Net Income – Program Costs. ROI% = (Net Program Benefits/Program Costs ) x 100. *Over the full implementation period, ROI = 773%. Therefore, the program was worth the expense.*

Estimation of ROI is not an exact science. A simplistic way to compute this ROI is to see it through the eyes of an entrepreneur. How much did revenues increase? Since previous revenues were \$700,000, and the training was completed in 2012, sum the incremental increases in revenue (revenue for the year less \$700,000) for 2012, 2013, 2014, and 2015 together. Divide this revenue incremental increase by the total cost of the training program of \$310,524.50. The result is 773%.

**TABLE 1**  
**SPRINGFIELD AUTO COLLISION: ANNUAL REVENUES**

Fiscal Year	Annual Revenue Amount
2011	\$700,000.00
2012 (Training Year)	\$1,000,000.00
2013	\$1,400,000.00
2014	\$1,900,000.00
2015	\$2,100,000.00

**Return-On-Investment Calculation**

$$\text{Sum of Revenue Increases for 2013, 2014, 2015} / \text{Training Program Investment} = \text{ROI} \times 100$$

$$\$400,000 + \$900,000 + \$1,100,000 / \$310,524.50 = 7.73 \times 100 = \underline{\underline{773\% \text{ ROI}}}$$

**Discussion Question 3 (for higher level students)**

Do suggested actions in Kumar, Antony and Tiwari’s Six Sigma Implementation Framework steps truly match Phillips and Stone’s training model phases? Why or why not?

*Notes on Question 3*

Until further research is done on multiple entrepreneurs adopting Lean Six Sigma, this alignment between the two models cannot be assumed. It may be only a happy coincidence. Further study is required. Students can give case examples of quotes that do match training phases. Due to the generic nature of some of the training phases, they could be matched with more than one of the steps in Kumar et. al.’s model.

**TABLE 2**  
**LEAN-COLLISION TRAINING AND IMPLEMENTATION COSTS:**  
**ANALYSIS, DESIGN, AND DEVELOPMENT**

<b>Craig Lindquist (General Manager) as Training &amp; Development Department</b>	
Independent Research (\$35/hr x 40 hrs)	\$1400.00
Books/ Resource Materials	\$100.00
<b>Subtotal</b>	<b>\$1,500.00</b>
<b>Delivery of Training (Off-Site) Minneapolis, MN</b>	
Green Belt Lean Training Tuition ((\$2,500 x 8 Employees)	\$20,000.00
Green Belt Lean Training Tuition for Craig Lindquist (General Manager) (\$2,500 x 1 Manager)	\$2,500.00
Training Time for 8 Employees (Salary & Benefits) (\$204.80/hr x 40 hrs)	\$8,192.00
Training Time for Craig Lindquist (Salary & Benefits) (\$35/hr x 40 hrs)	\$1400.00
Fuel and Rental Vans (75 Gallons x \$3.50 per gallon x 1 Vans = \$525) (\$800 Rental Fee)	\$1325.00
Lodging ((\$100 x 4 Rooms x 5 Nights)	\$2,000.00
Lost Sales/Production (7 Vehicles x \$2,100 per Invoice)	\$14,700.00
<b>Subtotal</b>	<b>\$50,117.00</b>
<b>Delivery of Training (On-Site) Springfield Auto Collision</b>	
Lean Consultant (6 Kaizen Events) (\$250.00/hr x 48 hrs)	\$12,000.00
Craig as Training Participant (\$35/hr x 585 hrs)	\$20,475.00
Employee Training Time (\$384.5 x 585 hrs)	\$224,932.50
Training Materials (Flat Screen TV \$1,000) (Training Manuals \$31.25 x 16 Manuals = \$500)	\$1,500.00
<b>Subtotal</b>	<b>\$258,907.50</b>
<b>Grand Totals</b>	
Analysis, Design, and Development of Training	\$1,500.00
Delivery of Training (Off-Site)	\$75,605.00
Delivery of Training (On-Site)	\$256,907.50
<b>Total Training Costs</b>	<b>\$310,524.50</b>

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