Society and Sites of Conscience: Operational Excellence in Prison Industries

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ABSTRACT

Prisons can utilize effective operations management and continuous improvement techniques to fulfill the obligations of stakeholders and provide an opportunity to try and support the rehabilitation of inmates. Iowa Prison Industries (IPI) offers a work training program for incarcerated individuals under the supervision of the Iowa Department of Corrections (IDOC). The program works with approximately 800 incarcerated “associates” to help them acquire skills necessary to obtain gainful employment upon release. This article shares some of the history of IPI’s Operational Excellence (OpEx) as well as reports on program impact. Preliminary findings and success outcomes have been encouraging.

KEYWORDS: Prisons, Operations Management, Six Sigma, Lean, Decision Sciences in Practice

Introduction/Purpose/Motivation

Prisons and correctional facilities across the world service a unique purpose to “correct” legal and societal miscues. Prisons can utilize effective operations management techniques to fulfill the obligation of stakeholders and provide an opportunity to try and support the rehabilitation of their inmates. The framework of human capital theory can be applied to examine the relationships between training programs and gainful future employment for incarcerated individuals (Flatt & Jacobs, 2018). Human capital theory (Schultz, 1961) argues that direct expenditures on education and skills training will all lead to increases in individuals’ income via increased employability and productivity within organizations. This can also lead to “economic mobility” for workers. In the state of Iowa (USA), Iowa Prison Industries (IPI) offers a workforce-development training program for incarcerated men and women under the supervision of the Iowa Department of Corrections (IDOC).

The program works with approximately 800 incarcerated “associates” to help them acquire both job-specific hard and soft skills (Becker, 2007; Flatt & Jacobs, 2018; Valentine & Redcross,
necessary to obtain gainful employment upon release. IPI has what is known as “traditional industries” which are the common training programs many states operate nationwide. They most often include the manufacturing of road signs, license plates, office furniture, graphic art, cleaning chemicals, etc. and recently expanded into COVID-19 related solutions like hand sanitizer and masks. IPI also operates a Private Industry Enterprise (PIE) where they partner with private industries to manufacture goods or services either inside the institutions or on-site at the partner company’s location. Both the IPI traditional and PIE programs have rules and guidelines set by the legislature in the Iowa Code around things such as who their customers can be, where their funds arrive from, and who can participate in the different programs.

This article will share some of the history of IPI’s operations as well as report on the impact of their programs including a brief history of the IPI work training program and a summary of the different training programs across the state with examples of the hard and soft skills incarcerated men and women can obtain. This article also includes an overview of the certificates and recognized apprenticeship opportunities available to them. Preliminary findings and success outcomes (e.g., recidivism rate) have been encouraging. A meta-analysis of 58 studies from 1980-2011 shows that “inmates who participated in correctional education programs had 43 percent lower odds of recidivating than inmates who did not.” (Rand, 2013).

Introduction/Design/Methodology/Approach

Background and history: Iowa Prison Industries

IPI is not appropriated tax dollars and thus must provide high quality goods and services to sell to customers to remain sustainable. An important element of this work is the use of operational excellence methods and tools, such as Lean Six Sigma, to provide a direct impact to IPI and an indirect impact to the ‘associates’ as they are re-introduced to the civilian labor force outside the prison walls. For IPI’s traditional industries, they often only sell goods and services to a limited customer base such as other government agencies including federal, state, county, and city; non-profit groups including churches, fraternal organizations, parochial schools, and school districts; as well as universities, hospitals, and nursing homes.

The creation of the Prison Industries, Manufacturing & Management System (PIMMS)

While Prison rehabilitation programs, including undergraduate degree programs such as those at Pitzer College (St. Amour, 2021) are not new, IPI has developed a unique program. In 2015, the leadership of IPI recognized the benefit and need to add a formal lean and continuous improvement program to IPI. Following a process improvement project, it was decided to create a permanent Training Specialist position and focus resources on creating and deploying a lean program structure across the operation.

The initial program that was developed used a two-pillar structure and represents the involvement of every leader, frontline staff member, and incarcerated individual working in the program. The PIMMS program was developed with the understanding that a strong foundation based on standardization would be the supporting base for the other tools and work methods that make up the “PIMMS Structure”. Those foundational tools are 6S, Standard Work, and Total Productive Maintenance (TPM). Figure 1 provides an illustration of the PIMMS model and associated continuous improvement tools.
Lean Six Sigma is more than a set of tools and ultimately results in the empowerment of end-users to take ownership of their overall workflow (Bumblauskas & Kalghatgi, 2018). There is a unique need for workforce training in prisons as incarcerated individual may have long gaps in employment and need development to bring additional value when they join a manufacturing work environment outside the prison industries. Through the adoption of PIMMS, a program that advocates Lean Six Sigma, prisoners have a unique ability to be leaders with advanced skills and, hopefully, also feel more empowered in their work and life after prison.
Of the foundational tools, IPI has discovered that 6S has been the ideal tool to introduce continuous improvement. We have often seen the use of 5S - Sort, Set in order, Shine, Standardize, and Sustain - used in contexts such as public service to help introduce a culture to Lean Six Sigma (Bumblauskas & Kalghatgi, 2018), but have expanded this at IPI to 6S with the addition of ‘Safety’ to the methodology. Being an organizational tool, it is very visual, generates almost immediate results of improvement, and is easily understood by all. Portions of 6S have been used in prison settings for years without most recognizing it. Shadow boarding tools to assist security for tool control have been in place for decades. Since 2015, IPI has taken 6S to new levels in nearly all of their operations at nine locations across the state. Each of 36 teams have held a 6S “event” that consisted of 6S training, setting the scope including objectives & goals, and then implementing those changes. While 6S is widely used as an organizational tool to improve efficiency, it also has significant security-related benefits in the correctional industries environment. Anything in the area that is not needed is removed during the “sort” process of 6S. Many of those items can easily become contraband or possibly be converted into weapons in the wrong hands. In addition, IPI has also greatly improved the line of sight for staff by eliminating unnecessary materials racking and redesigning cell layouts that eliminate blind spots for staff and surveillance cameras. These improvements have created a much safer work area for everyone. For example, Figure 2 shows before and after photos of 6S improvements in the Anamosa, Iowa Metal Furniture operation.
To sustain the 6S work being done, IPI has put in place a weekly 6S audit process. All of IPI’s leadership, staff, and incarcerated individuals have the opportunity to participate in completing weekly 6S audits that provide feedback detailing examples of things going well and opportunities for improvement. The audits use a scoring system that ranges from 1 to 5. Anything that scores a 1 or 2 is an improvement opportunity and gets noted on the teams’ metric boards. The item then gets assigned to someone to address. That individual will decide the corrective action, set the time frame, and do any status updates on the metric board so all the team members are informed of the progress. Scoring a 3 is average to good. A score of 4 means something is better than average and it could be an example of a best practice to share with other teams. Scoring a 5 is something exceptional and is potentially worthy of sharing with others to become a new standard for everyone to adopt. The audits are broken up into sections with several questions for each of the 6S categories -- Safety, Sort, Set in order, Shine,
Standardize, and Sustain. Figure 3 below is an example of how the Fort Dodge IPI textiles team tracks their 6S and Standard work audit (LPA) performance over time.

![Figure 3 – 6S Audits Scoring](image)

Some examples of improvements made due to the 6S portion of PIMMS at IPI include:

- Many areas were cleaned and painted to make it a more pleasant place to work.
- Shop lighting was replaced with brighter and more energy efficient LED lights.
- Labeling of all the equipment and materials was done to make it visual for all.
- Office operations developed a naming system for electronic files so they would be easier for everyone to find.
- Min / max levels setpoints were established and displayed for many raw materials and finished goods.
- Production areas were moved to create better process flow through the areas.
- Additional floorspace was created for new production. In one specific instance, 400 sq ft was freed up and a housekeeping chemical mixing and bottling operation was expanded creating additional jobs.
- A materials storage building was converted into space to do packaging for a private sector operation creating over 100 additional jobs in the Rockwell City location. Similar efforts in Mitchellville, Fort Dodge, and Mount Pleasant have allowed for expanding that partnership which created an additional 200 positions.
- All areas have either painted or had floor tape installed using various colors based on industry standards to indicate where movable items (such as pallet jacks, trash cans, material carts, etc.) should go. They also mark the pedestrian walkways, electrical and safety area clearances, and production equipment. Different colored areas have also been added for raw materials, finished goods, work in process, as well as non-conforming items.
Figure 4 provides an example of the color code system used from a company that supplies tape and labeling materials. That company is Creative Safety Supply.

Figure 4 – Supplier Floor Tape Taxonomy (source: Creative Safety Supply)

The other lean tools that make up the foundation of standardization for PIMMS are standard work documentation and total productive maintenance (TPM). Documented standard work is an especially useful tool in a prison industries type of environment. The goal of any prison industries work program is to teach and develop skills so when those individuals are released, they have a greater opportunity to obtain gainful employment (Becker, 2007; Flatt & Jacobs, 2018; Valentine & Redcross, 2015) so naturally, prison industries work programs want to have significant turnover of individuals. The standard work developed in IPI’s program is a collaborative effort by qualified operators that agree upon the safest, most efficient method known. By using this approach, IPI has found operators have much greater ownership and discipline to follow the process as it is written. Following the documented standard work is critical for continuous improvement. Without standards, there can be no continuous improvement. Standard work is the wedge that keeps the Plan-Do-Check-Act process of continuous improvement moving forward. Another unique situation related to correctional industries is the fact that operations can be impacted at a moment’s notice due to a security-related incident. Contraband or a fight can put part of or the entire operation into lockdown status. Depending on the situation, operations may be down for long periods of time. Additionally, the current qualified operator may or may not return. While no standard work can
capture every detail or replace experience, professionally written standard work provides a starting point for training new operators in the event of unsuspected personnel changes.

Because standard work is an important part of the PIMMS foundation, IPI developed standard work audits for the operators and staff to perform weekly. These audits are interactive. The auditor reinforces that they are auditing a process and not the individual. The audits cover topics such as safety awareness and who to ask when they have questions or need help. When someone does need help, the auditor watches the process, following along with the documented standard work to ensure the steps are being followed in the proper order along with any key points or required details followed. Doing the audits has the added benefit of helping the team discover opportunities to improve the documentation or add visual aids for important steps if the auditor has questions or struggles to understand what the documents are trying to show.

The final tool that comprises the foundation of the PIMMS structure is Total Productive Maintenance or TPM, which is an operator-owned maintenance program that utilizes their skills to keep the machinery in the best working condition possible. The operator that runs the machine daily is in the best position to recognize any changes in performance, leaks, vibrations, or any unfamiliar noises or odors. Those observations will catch any changes early and reduce or eliminate catastrophic machine failures. It also allows the team to plan for preventative maintenance downtime when it fits best into the production schedule. Operators have daily task cards for items they can be trained to check such as machine speed or temperature settings, pressure levels, and any fluid levels. The task cards list the station, the type of task required (6S or TPM), what the task is, and when it should be completed (e.g., start of shift, during shift, or end of shift). All machine control adjustments and any gauges are verified that they are operational, and gauges are color coded. The operators are trained that if the needle is in the green zone, it is good to operate. All fluid reservoirs are marked with the operating range and what type of fluid to use. Any lubrication points are color coded to identify if they need to be greased daily, weekly, monthly, etc. Figure 5 below provides an example of a TPM task card from the Anamosa Filter shop.
Another important aspect of TPM being used by IPI is using Overall Equipment Effectiveness (OEE) calculations to find ways to understand capacities and address the variables that make production improvements. OEE is calculated by multiplying the percentages of available minutes times the efficiency rate times the defect rate. Many of the teams were shocked to discover in their normal 8-hour day (480 minutes), a large percentage of that time was not being used for production. Clocking in, checking out tools, daily meetings, two prisoner counts, breaks, lunch, checking tools back in, and clocking out all took away significant production time. The other pieces of the OEE equation look at losses due to machine slowdowns and set-ups as well as the impact of product damage due to tooling or machine operation. By collecting the data for the equation and examining the process, many teams have found ways to improve their output capacities.

The PIMMS structure has two pillars. One pillar focuses on visually managed metrics and operations. The other pillar focuses on people involvement. Visually Managed Metrics is based on all IPI’s 36 teams having an aforementioned metric board where each team meets daily. They discuss successes, plans, and opportunities. Each team also sets SMART (specific, measurable, attainable, realistic, and time-bound; Locke & Latham, 1990) goals that their work can influence and align with the overall goals for the entire IPI operation statewide. The areas measured are Safety, Quality, Delivery, and Sustainability. The metric board is designed to be a central hub for information for the team. There is an area for the team’s challenge, announcements, their 6S and Standard work audits and performance plotted over time, and a countermeasure sheet where the team records and tracks any opportunities for improvement.
The team meets daily and asks the question, "Did we meet our SMART goals for today?" If they did, they color the day in green. However, if they did not, they color that day in red and identify the opportunity on the countermeasure sheet. When they have problems or opportunities, they also have a Process Problem Solving Sheet (PPS) on the board. A PPS is designed to be a team brainstorming tool that examines the possible causes of a process problem using a fishbone diagram, and then uses the 5 why’s tool to identify and document the possible root cause of the issue. Figure 6 is an example of the IPI team metric board.

Figure 6 – IPI Metric [Huddle] Board

The second pillar in the PIMMS structure is for People Involvement. The focus on this part of the structure is to teach and develop skills in individuals so they have a greater chance of obtaining a job upon release. The vision of the IPI program is to provide a meaningful work training opportunity to develop utilizable skills for every person. Those skills not only include a variety of work skills, but also the soft skills of working together as a team, maintaining good attendance, and developing problem solving skills. Meeting daily as a team, leading the daily meetings, and performing weekly 6S and standard work audits all help develop these skills. In addition, IPI has a Continuous Improvement Idea program where individuals can submit an idea for improvement and earn a small bonus of cash, treats (soda or candy bars), or a combination of both. There are 3 levels of bonuses which are determined by the amount of effort and thought put into the idea as well as the impact the change has on the operation. There have been ideas ranging from improving safe working conditions to reducing scrap or improving process outputs. There have been thousands of ideas submitted since starting this process in 2018. For those areas that track their idea submissions, it is common to have over 80% of the ideas submitted be implemented. Another powerful tool included in the People Involvement area of PIMMS is the use of quarterly reviews. IPI has tested a pilot group and is in the process of rolling out a program where every individual working in any role at any location will once a quarter have the opportunity to sit down face to face with their supervisor and share feedback in both directions. They will discuss what is going well and an opportunity to further develop some area or skill. The reviews are documented and for any incarcerated individual, those documented reviews will
be available to them upon being released so they may share them with future employers if they choose to do so.

Every year, IPI works to find ways to improve their PIMMS program. It was recognized that to make improvements to PIMMS, there needed to be a way to measure or gauge the progress and success of each team deploying PIMMS. The tool that was developed to measure the progress of PIMMS deployment is called the belt level assessment tool. The belt level assessment tool has 5 categories. The foundational tools of PIMMS are each a category. Those include 6S, Standard Work, and TPM. The other two categories include Visual Metrics and Engagement. Desired behaviors were then defined for each category and assigned to a belt color level like those used in martial arts and academic / industry Six Sigma programs.

Figure 7 – IPI Belt Level Assessment

Findings/Relevance/Contributions
Each industry, past and present, gives the chance at a better, brighter future for Iowa’s incarcerated individuals. Having meaningful work training opportunities during incarceration has two primary benefits. First, it develops skills in the incarcerated individual that will help them have a new start in their life (Becker, 2007; Flatt & Jacobs, 2018; Valentine & Redcross, 2015). Often, incarcerated individuals have never held a job prior to coming to prison. The skills they can acquire include not only specific trade work skills, but also essential skills such as good attendance, being on time, working well with teams, making good decisions, basic reading & math skills, interpersonal skills, as well as personal characteristics and attitudes (Tonkin, Dickie, Alemagno, & Grove, 2008) are crucial for a returning citizen to possess. These may sound simple, but to an adult individual that may not have a history of traditional employment, these are key. Second, the skills training creates a new level of confidence when reentering the workforce and society (Pearson, Lipton, Cleland, & Yee, 2002).

Conclusion and Future Work
Between 2015 and 2021, IPI has continued to develop PIMMS which uses lean tools and continuous improvement thinking to solve problems and create further opportunities. Developing this mindset and culture has opened the door to expanding the program by more than 200 additional work training opportunities for the men and women incarcerated with the IDOC. Most of these individuals working in the IPI program will be released upon completion of their sentence. By developing work skills along with the problem-solving skills gained within the PIMMS program, the individuals in the IPI program are much more likely to be equipped to find a good paying job which greatly increases their chances of a successful re-entry into the
community. While preliminary results on the recidivism rate for all the IDOC vs. those that have participated in the IPI work training program have been promising, more data is being collected to validate this.

References


Further Reading
