



Statement of Program Practice and Results

Facilities & Real Estate Services (FRES) at the University of Pennsylvania (Penn) look to provide innovative and cost-effective solutions that embrace the University's rich past and enhance the quality of the living and learning experience.

FRES vision is to *collaborate for a sustainable tomorrow*. Like many institutions, the pursuit of this vision is coupled with challenges such as deferred maintenance, rising costs, and changing customer expectations. Accordingly, FRES needed a new way of working to drive innovation and the way it does business. In 2008, FRES began applying a philosophy called Lean to increase the value delivered to customers, reduce waste in existing processes, and do so in a way that respects the talents of its people.

Lean has been applied in two main areas, with two others underway:

- Maintenance Work order management
- Solid waste management
- Housekeeping (underway)
- Preventive maintenance (underway)

As a result of these Lean initiatives, FRES has realized a decrease in maintenance expenses, faster completion time of work tickets, standardization, and increased customer satisfaction. Beyond quantitative results, FRES has discovered a different way of working that fosters innovation and tears down silos. Tradesmen, housekeepers, sustainability staff, managers, and administrators work together to deeply understand the current state and rapidly develop consensus for change. This Lean way of working has helped FRES staff engage in systems thinking. Now everyone sees the whole picture, rather than just seeing problems through their own lens.



Institutional Benefits

Using Lean to make changes within FRES has provided a number of meaningful benefits to Penn both within the individual improvement projects and more broadly in changing the way FRES works. As illustrated below and described in the results section, the benefits have ranged from reduced time, effort, cost, and frustration to increased collaboration, coordination, and staff satisfaction.

Lean for Optimizing Maintenance Practices and Work Order Management.

FRES receives over 80,000 maintenance requests annually. There was much opportunity to improve the process for the 280 maintenance mechanics in 20 trade shops and their customers. For example, prior to applying Lean, the Electrical Shop implemented a 126 step-process to execute a work order. Accordingly, there were more than 400 work order tickets in the backlog, and only 8.2% of the work was completed in “one touch” (during the first visit). Through Lean, they learned that what was most important to their customers was getting a problem resolved the first time a mechanic was deployed to a given site. Equipped with this vital information, the Electrical Shop sought to reduce the number of steps in the process to expedite the work orders and increase the “one touch” visits. After going through a rigorous process in which people directly involved in work orders (union tradesmen and managers) applied Lean principles and tools, they were able to understand the current state, assess customer value, and identify waste in the system. They were able to reduce non-value added process steps and the time it took to resolve a work order. This same process was repeated for each of the 20 maintenance shops over the span of 4 years total. A cross-functional corrective action team representing multiple shops now monitors performance and makes ongoing changes.

By making problems visible and empowering the staff to address those concerns, Penn has been able to improve the efficiency and effectiveness of many long standing processes from the bottom up.

Lean for Developing and Implementing a Cross-Cutting Solid Waste Management Plan

Penn had many disparate waste management efforts underway. These individual and departmental efforts lacked cohesiveness and consistency across campus and were preventing Penn from achieving its goals (increase diversion rate of paper, cardboard, and commingled recyclables from 20% in 2008 to 40% percent by 2014, increase overall recycling rate from 31% to 40% by 2014). Through a series of facilitated Lean workshops various stakeholders from across the campus came together to holistically understand waste management at Penn. What emerged were six major waste streams, 110 different types of waste bins, 35 different types of signage, and 71 problems in the processes (of which 32% were perceived as easy to rectify). Individuals from 12 different schools and centers, together with representatives from the Green Campus Partnership (GCP) sustainability group and FRES developed 119 ideas that would eliminate these problems and streamline the processes to have a cohesive, university-wide waste management system. These 119 ideas informed the Solid Waste Management Plan for the campus, and were later implemented by a Working Group.

Lean has provided effective methods for engaging diverse stakeholder groups in a process which has facilitated rapid understanding, quick decision-making, and strong alignment. These methods have strengthened the relationship among stakeholders on campus and improved collaboration.

Great collaboration is occurring in each of Penn's Lean improvements efforts. To date more than 100 FRES staff and customers have been engaged in Penn's Lean journey.

Characteristics or qualities that make this program or practice different or innovative

The Lean principles and tools that have been adopted by Penn are not new. These approaches have been used in manufacturing for many years, and have recently been implemented in construction and delivery of patient care in hospitals. What is innovative in bringing this approach to Facilities Management is 1) Penn's holistic adoption of Lean Principles as part of the culture; 2) Penn's application of Lean to knowledge-based processes (versus physical processes); and 3) its use of Lean as a means of developing strategy, planning for change, and implementing change. Many organizations, and even some Facilities Organizations, have applied Lean to discreet process changes. FRES has begun a Lean journey to change the way they do business. Specific attributes that make Penn's adoption of Lean as a philosophy and way of working different and innovative compared to traditional Facilities Management approaches are the following:

This practice drives behavior change from within. The ideas for improvement in the various processes and systems come from within, from the people actually doing the work. In many programs, there is a top-down decision-making structure. By using a Lean approach and adhering to the Lean Principle of "respect for people", Penn empowers the people directly doing the work to articulate and share with others what is making processes inefficient based on what they actually see and experience every day. These vital individuals also generate ideas for improvement that inform the strategy for change. Implementing a strategy or plan that is a direct result of ideas that come from the people doing the work is extremely motivational to them, and taps into human potential to drive sustainable change over time more so than a plan in which people are told what to do.

This practice supports systems thinking and methodical examination of root causes of problems. The world of Facilities Management has never been more complex or dynamic. Facilities Managers are often facing adaptive challenges. Unlike technical challenges which are well understood and have been solved before, these "adaptive challenges" have the added complexity of requiring changes in people's values and behaviors. By applying a Lean approach to managing work orders, waste management, the housekeeping program, and preventive maintenance, representatives from Penn recognized that they may not understand the source of the problems they were experiencing and that these are not just problems which could be solved with new technology. The teams conducted rigorous root cause analyses to understand why certain elements of a program appear to be problematic. Are these symptoms of a bigger or different problem, or are they truly the problems that the group is facing? The Lean approach drives staff to ask: *why* are we doing what we're doing and what value does it provide? It encourages people to question proposed solutions and implement only ones that maximize resources in specific environments by taking a close look at the whole system. By taking this approach, Penn is able to identify the actual problem and develop solutions which will produce the biggest impact for the University.

This practice is driven by a focus on the customer. By engaging customers in its Lean efforts, FRES has developed a much stronger understanding of what its customers value and how FRES was doing in meeting customer needs. In other approaches, groups tend to focus on what sounds like the biggest problem. Sometimes these problems are ones that are actually not the most important to the people who are served by a particular process. Because Penn took a Lean approach to this work, they now have the tools to make the most significant impact through applying Lean, and know where to dedicate valuable resources and people's time to make improvements.

Portability: How this practice can be used by others

The beauty of Lean is that it is not proprietary and it can be applied to make both incremental process improvements (like work order management) or to develop broad strategic changes (such as developing a waste management strategy). Penn shared this approach at two industry conferences where it was extremely well-received by peers in Facilities Management. Other universities can apply these principles and tools in a variety of ways:

- ***Deeply understand who your customers are for a particular process and what they value.*** By understanding what purpose a process serves, and who it is intended to serve, you can focus on the aspects of the work that are of the highest value. In the world today, there is too much to do and know. Therefore, it is important to discern what will have the biggest impact on improving a situation.
- ***Develop people and partners.*** Treat all people involved in a process as having expertise in what they do. In Lean, we often say “go to gemba,” which means go and see where the work takes place. It is where the work takes place (with the people who do the work) that problems can be exposed and improvement opportunities can be found. By respecting each individual involved, you can learn from one another and improve systems. Furthermore, if you develop people and partners to understand Lean, you can seek continuous improvement because everyone is committed to making things better.
- ***Consider what your biggest pain points are and embrace the problems you face.*** In Lean, we say that “problems are gold” and problems are a form of waste. The great Lean sensei, Dr. Shigeo Shingo, said “the most dangerous kind of waste is the waste we do not recognize.” Therefore, it is critical to see problems so that they can be addressed.
- ***Consider the long term, and make sure you are addressing the right process.*** It is easy to jump to solutions when faced with a problem. With new technologies, increasing time constraints, budgetary pressures, and other pressing issues, it is natural to want to find the “quick fix.” Instead, pause and consider the bigger picture. If one problem is solved, is it the actual problem, or the symptom of a bigger problem? If this problem is solved, what are the short and long term effects? Will solving the problem have a long term benefit? What unintended consequences will addressing it result in?



Demonstration of management involvement and employee commitment

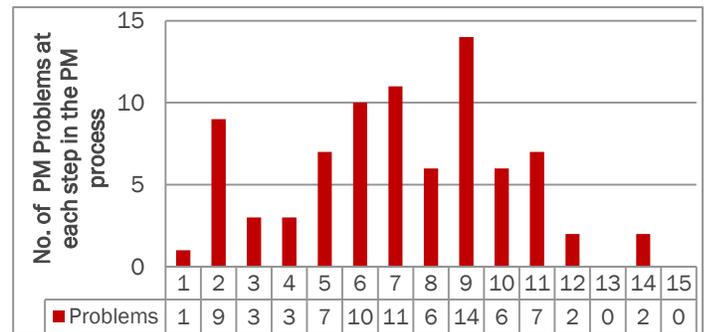
Lean organizations respect people by taking advantage of their talents and fostering collaborative environments where cross-functional teams work together to make change. True to this Lean principle, FRES is engaging managers, trades, faculty, and students to work together to change current practices. FRES has gained great support from management in its Lean endeavors.

In order for this approach to be successful, it must have support from both management and employees. A key tenant of Lean is that improvements should come from the people “closest to the work”. At the onset of the projects, leaders including Ken Ogawa, Executive Director of Operations and Gerry McGillian, Director of Facility Trades, were both supportive and engaged in understanding the needs and effectively assessing the financial and time investment as well as participation that would be required to ensure long term success. Often, Ken and Gerry kick off Lean improvement events and empower the teams to develop recommendations. Most critically, Ken and Gerry then step away and give the work back to the people.

Because employee engagement is inherent in this type of work, people are deeply motivated to make continuous improvements and remain engaged. Traditional barriers among individuals in different levels of the organization dissolve as people realize common goals and shared interests. It is through this work that ideas come from within – from both management and employees alike. Lean results so far have led to the commitment to future projects:

Lean for Assessing the Current State of the Housekeeping and Preventive Maintenance (PM) Programs

With two successful applications of Lean under their belts, FRES has embarked on tackling two more programs which will yield high impact on both customer satisfaction and stewardship: the Housekeeping Program and the PM Program. These projects are underway and both started with an initial diagnostic analysis of the current state using a Lean approach.



Finding focus. 60% of problems were identified in 6 of the 15 process steps

PM Problem Theme	# of Problems	% of Problems
Communication & Schedule	31	33%
Data Management & Quality Control	39	31%
Resources (Financial, Staff)	13	14%
Tools & Materials	6	6%
Miscellaneous	17	16%
Total	106	

Approximately 20 people are involved in each of these improvement efforts ranging from housekeepers and mechanics to directors and customers. In accordance with Lean Principles, the cross functional teams have engaged in activities to identify what matters most to the customers of these two processes and develop a shared understanding of “what actually happens”.

Through this work, more than 200 opportunities for improvement were identified related to the unionized Housekeeping Program and approximately 100 opportunities for improvement in PM. Lean prioritization approaches help the teams to quickly see themes and where in the process problems were occurring.

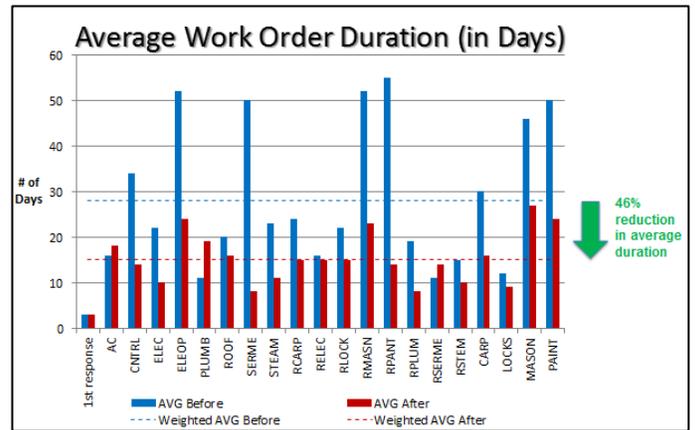
Now that these key customer values and associated problems have been identified, Penn has the ability to focus on what is most important.

Documentation of results, analysis, customer feedback, and resulting benchmarks

FRES is on a continuous improvement journey. Accordingly, Penn is still in the process of documenting some of its results. However, it has experienced a variety of benefits in each of the areas that it has applied Lean. Below are some examples of the results thus far:

Maintenance Work Order Management

After going through a rigorous process in which people directly involved in work orders applied Lean principles and tools, the Maintenance Department was able to reduce the average duration of a work order by 46%. Each shop methodically examined its processes. For example, the Electrical Shop reduced the number of steps in its process from 126 steps to 15 steps. Today, the shop is able to accomplish 92% of work with “one touch” (vs. 8.2% before), and reduced the backlog to approximately 70 tickets (from 400 tickets). The Electrical Shop is now able to complete (on average) 76 tickets/week, compared to 52 tickets/week prior to applying Lean, demonstrating a 32% improvement to the process and service delivery to customers.



Solid Waste Management

Through applying Lean, a large group of customers, stakeholders, and those involved in the managing waste on campus agreed to and produced documentation of standard colors for all of campus. Three standard signs and pictograms, respectively, are also in the process of being rolled out. This will decrease confusion across campus, where there were previously 35 different signs with different verbiage. Revised recycling guidelines have been developed, best practices documents have been written, six standard operating procedures for high-impact processes have been developed and agreed to by a diverse group of stakeholders, and a standard announcement for managing waste at large events has been written. Standard bins and lids to encourage end-users to manage their waste correctly have been approved, and revised webpages are in the process of being finalized to increase clarity and shared understanding of how to manage waste. In 2014, the group will work together on managing e-waste, developing a university-wide tracking system and dashboard, implementing training on the new processes, and improving the recognition program for Housekeepers, who are a vital part of this work.



Preventive Maintenance and Housekeeping

Both the PM and Housekeeping teams are in the process of building on their current state analysis and prioritization to develop improvement plans to pilot stage in 2014. Perhaps the most important achievement of both of these teams so far is the engagement of customers actively in understanding the needed improvements. By engaging the Facility Manager directly in customer value workshops, FRES is gaining valuable insights and creating a more effective working relationship with its customers. This customer focus is taking hold and staff is better able to see examples of wasted time and effort on activities.

The teams look forward to being able to expand the use of this Lean process improvement technique into these new areas.

Some feedback from staff...

Employees who participated in this work made the following comments:

- “A wide net was cast – I appreciated this” [to have representation from different schools and departments].
- “I liked how everyone was able to challenge one another and find common ground respectfully,”
- “We’ve built alliances and relationships in this room, and I want to continue the momentum within this group.”
- “I learn a lot every time we do this [type of Lean work] and appreciate everyone being here. It makes it easier to work on these things with support from each other.”
- “It’s a really easy thing to lose sight of: customers and what they value, and it is really important to remind ourselves of that”
- “I think it’s commendable that a large group of individuals working on different aspects of campus are willing to take the challenge to put together a standardized procedure for a particular thing that everyone is passionate about.”
- “I’m struck by how you can take these complex things and really break them down with this process by applying the Lean framework. It really makes breaking them down into individual tasks so much clearer and in the end, simpler.”
- “It’s hard to believe that we accomplished as much as we did.”