Adapting Lean Principles to Educational Facilities

University of Central Oklahoma Streamlines its Physical Plant Work Order Process

Published November 2009

A common area of frustration for university campuses is maintaining facilities to meet the institution’s mission. The University of Central Oklahoma (UCO) has long struggled with limited funding and staff to address campus needs in facilities and other administrative areas. In 2002 the campus instituted Lean Principles as a process improvement method.

Lean principles originated in the manufacturing world as a way to streamline processes by identifying and eliminating waste. Lean principles can be applied to any process, however a process viewed to be a major “pain point” shows the effectiveness of Lean quickly. Employees see the improvement and appreciate the efficiency of the changed process.

“Pain Point”

UCO identified the Physical Plant work order system as a “pain point.” Between 1992 and 2002, UCO’s Facilities Management Physical Plant had gone through four changes in leadership. As a result of these changes employee morale was extremely low. Routine (non-emergency) work orders took on average 24 days to complete. Confidence in the Physical Plant staff’s timeliness and abilities to complete jobs were ranked poor in satisfaction surveys. Change was crucial to addressing the university’s growing needs.

Applying Lean Principles in the Physical Plant work order system resulted in a reduction from 3,000 open work orders per month to 300, and reduced lead time for routine work order response calls from an average of 24 days to two days. These reductions were accomplished without increasing staff and in fact allowed two administrative positions to be reallocated to other departments on campus.

Lean Team

UCO’s Lean Team consisted of frontline workers, a manager, and on-campus customers. As a team, they focused on the problem of long response time to work orders. The goals were:

- Reduce lead time on completion of work orders
- Develop a tracking system for open work orders
- Reallocate wasted funds to address other funding needs
- Involve employees in streamlining the process

Improving the process focused on time, flow, and value added analysis. The team worked to identify the wasteful actions, also known as non-value added steps. Mapping the process as it was actually being performed provided a visual guide to calculate the time to completion, flow of the steps, and verification of wasteful action. The acronym “WISDOM TO” is used to remember the eight categories of waste analyzed when implementing change:

- Waste
- Inventory
- Stagnation
- Operations
- Movement
- Delays
- Overproduction
- Waiting

For More Information

Since 2007 UCO has offered Lean Facilitator Certification programs to aid higher education and government organizations to begin their journey with Lean. Get more details on the training program at leanuniversity-uco.com or by emailing kkusler@uco.edu.

Table A

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Open work orders</td>
<td>3,000</td>
<td>300</td>
<td>Av. 300</td>
<td>99%</td>
</tr>
<tr>
<td>Pieces of paper generated</td>
<td>19</td>
<td>2</td>
<td>1</td>
<td>99%</td>
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<tr>
<td>Annual cost</td>
<td>$15,597</td>
<td>$1,262</td>
<td>$500</td>
<td>99%</td>
</tr>
<tr>
<td>Travel path of work orders</td>
<td>1,265 feet</td>
<td>253 feet</td>
<td>5 feet</td>
<td>99.6%</td>
</tr>
<tr>
<td>Average # of touches</td>
<td>28</td>
<td>5</td>
<td>4</td>
<td>85%</td>
</tr>
<tr>
<td>Average age of pending work orders</td>
<td>24 days</td>
<td>2.6 days</td>
<td>2 days</td>
<td>92%</td>
</tr>
<tr>
<td>Work orders submitted electronically</td>
<td>27%</td>
<td>91%</td>
<td>92%</td>
<td>241%</td>
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<tr>
<td>Emergency requests</td>
<td>&gt;40/month</td>
<td>NA</td>
<td>&lt;1/month</td>
<td>98%</td>
</tr>
</tbody>
</table>

Notes:
Value Stream Mapping

Value Stream Mapping (VSM) format was used to map time-on-task, quantity-in-queue, communication channels, and customer expectations. After mapping the current state, the process was remapped to eliminate non-valued-added steps, reducing the number of steps from 28 to 15.

The following examples of change fall into eight areas of waste (area of waste identified in parentheses):

- Approval of routine work orders frees up $42,000 per year of labor resources for managers by setting criteria for work orders requiring a manager’s approval (Waste of Waiting, Sources, and Over Processing).
- Shop supervisors gather material at local vendors and the vendor contacts the UCO Supply Department for the campus credit card number. Previously supplies were ordered through the purchase order system, costing $65,000 per year with a higher cost related to risk and reputation estimated at $900,000 per year (Waste of Waiting).
- Fixtures and products were standardized to reduce stock inventory and saves the university $30,000 annually (Waste of Inventory).
- The footprint for inventory storage was reduced and frees space valued at $202,000 (Waste of Inventory).
- Reassigned positions previously used for intake of written work orders when the system moved to online reduced the budget $36,000 annually (Waste of Sources).
- The addition of a preventative maintenance plan and, subsequently, the reduction of emergency work orders reduced the number of emergency work orders from 40 per month to less than one per month (Waste of Sources).
- Saved $4,600 in annual salary expenses through the design of an online submission form that defines critical information and reduces the need to contact the requester for incomplete information on the work order request (Waste of Defects).
- Reduced the confusion on duplicate work orders with detailed information required on the work orders which enabled the shops to respond to open work orders more quickly and reduced the rework of jobs completed by departments due to poor workmanship. Shops reduced the number of times they “touch” a work order until the job is completed. Overall “touches” were reduced from 28 to four (Waste of Waiting and Overproduction).
- The work order document travel was reduced from 1,265 feet to 253 feet, and eventually to five feet (Waste of Travel).
- Preventive maintenance plan established a structure where shops coordinate repairs as a project addressing the root cause of the problem (Waste of Over-Processing).

The action of moving from the old way used in the process to the new streamlined way of doing things is known as Kaizen. Teams working directly in the process implement Kaizen Events during which change is made. The Physical Plant’s initial Kaizen Event focused on restructuring the filing system, work order distribution, and submission of work orders. The three-ply form previously used became an online form that allowed the submitter to track the progress of the work order. Obsolete copies were purged and training provided to users on the new system.

Routine work order approval was reduced from including the Physical Plant Director and supervisor to only the supervisor.
Assignment boards in each shop provide visual status of work orders for both the workers and managers. A first-in, first-out (FIFO) system was used for routine work orders, which eliminates the cherry picking of preferred jobs by the technicians.

**Metrics**

Metrics are used to gauge improvement in specific areas. Table A (see righthand column) summarizes the metrics for the Physical Plant work order system at three points of reference. Metrics prior to the Kaizen Event (“Before 2002”) reflect the current state VSM process. “After Kaizen” metrics reflect the transition to the future state VSM. Metrics in the “2008” column represent the sustained change in the process.

The Physical Plant effectively met the goals of the Lean Implementation. Work order lead time was reduced, a tracking system was implemented to monitor open work orders, funds secured through savings in the process were reallocated for other needs and every Physical Plant employee has been and continues to be involved with streamlining the process.

The changes added the value desired. Safety issues are responded to more quickly, facilities are on a preventive maintenance schedule, quicker response is given to work orders delivered with a positive attitude, and the University mission of providing an education for students is supported through well-maintained facilities.

**Survey results**

To measure the impact on the UCO campus and with the Physical Plant employees, surveys have been conducted. The 2008 campus satisfaction survey resulted in an overall 85 percent satisfaction rating. The two areas needing specific attention are the transition of building temperature and cleanliness of restrooms. The Physical Plant management are working with the third-party service vendors to improve performance.

According to the employee workplace survey, Physical Plant employees are comfortable stepping out and trying new ways to accomplish their tasks to best serve the campus. The Physical Plant employees continue to make improvements with changes in the supply checkout system, report format for open work orders, native landscaping planning, and recycling program. “Why?” is a question commonly heard when discussing a project or situation that is not working smoothly. Questioning the reason behind the problem helps to ensure that they come up with the best possible solution that addresses the root of the problem. An environment of Lean thinkers has evolved and has been sustained in the Physical Plant since 2002.

**By Karen Kusler**, Director of UCO’s Lean University Training Program and UCO Lean Facilitator, with key contributions from UCO’s Robert Nall, Assistant Vice President for Facilities; Mark Rodolf, Director of Facilities Management; and Mark Moore, Work Order Lean Event Team Member.

This report is based on a presentation by Steve Kreidler, UCO’s Executive Vice President of Administration, at Tradeline’s 2009 Lean Processes for Facilities Management & Capital Projects conference.

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ISSN: 1096-4894