ABSTRACT

UNDERSTANDING AND IMPROVING LEAN PARTICIPATION WITH A FOCUS ON ENVIRONMENTAL INITIATIVES IN MIAMI UNIVERSITY’S DEPARTMENT OF PHYSICAL FACILITIES

by Anna Louise Ginsky

Lean service is a framework for improving organizational performance by increasing process efficiency in service sectors, such as universities. Lean is also being used as a tool to increase environmental sustainability. This practicum report explores the process of expanding the lean program within Miami University’s Physical Facilities. Methods included interviews with lean participants and a department-wide survey to better understand the barriers and benefits to participating in the lean program. Barriers included the lack of time, knowledge about how to participate, and training options. Benefits included knowledge gained, improving Miami’s overall sustainability, and new connections made with coworkers. Based on research, lean training, interviews, and survey responses, I developed a one-hour lean seminar emphasizing environmentally friendly lean projects. The seminar was conducted with three groups of employees, a total of 24 participants. Their feedback was used to improve the seminar, which is available in its final form in this report.
UNDERSTANDING AND IMPROVING LEAN PARTICIPATION WITH A FOCUS ON ENVIRONMENTAL INITIATIVES IN MIAMI UNIVERSITY’S DEPARTMENT OF PHYSICAL FACILITIES

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# CONTENTS

## CHAPTER 1. BACKGROUND ON LEAN .................................................. 1

1.1 WHAT IS LEAN? .............................................................................. 1
  1.1.1 LEAN HISTORY .................................................................... 1
  1.1.2 LEAN SERVICE .................................................................... 1

1.2 SUSTAINABILITY WITHIN THE PUBLIC AND PRIVATE SECTORS ...... 2

1.3 LEAN AND GREEN IN GOVERNMENT AND COMMERCIAL SECTORS.... 3

1.4 LEAN AND GREEN IN THE EDUCATION SECTOR ............................ 5

1.5 LEAN AT MIAMI UNIVERSITY .................................................... 7
  1.5.1 LEAN IN THE DEPARTMENT OF PHYSICAL FACILITIES .......... 8

## CHAPTER 2. LEAN AND GREEN AT THE DEPARTMENT OF PHYSICAL FACILITIES .......................................................... 10

2.1 PRACTICUM DESCRIPTION .............................................................. 10
  2.1.2 PRACTICUM SIGNIFICANCE .................................................. 10

2.2 LEAN 2-DAY TRAINING SEMINAR ................................................. 10

2.3 METHODOLOGY ............................................................................ 11

## CHAPTER 3. UNDERSTANDING CURRENT PFD EMPLOYEE INVOLVEMENT AND PERCEPTIONS .................................................. 13

3.1 INTERVIEWS .................................................................................. 13
  3.1.1 INTERVIEW METHODS .......................................................... 13
  3.1.2 INTERVIEW RESULTS ........................................................... 14
  3.1.3 INTERVIEW DISCUSSION ....................................................... 16

3.2 SURVEYS ....................................................................................... 17
  3.2.1 SURVEY METHODS ............................................................... 17

3.2.2 DATA ANALYSIS ................................................................... 19

3.2.3 SURVEY RESULTS ................................................................. 19

3.2.4 SURVEY RESULTS DISCUSSION ............................................ 23

3.3 DISCUSSION ................................................................................. 25

## CHAPTER 4. LEAN AND GREEN OUTREACH TO PFD EMPLOYEES ........................................................................ 25

4.1 DEVELOPING THE ONE-HOUR TRAINING .................................... 25
  4.1.1 SECTION ONE: OVERVIEW OF LEAN ..................................... 26
  4.1.2 SECTION TWO: MIAMI’S LEAN FRAMEWORK .......................... 28
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>Eight types of lean waste</td>
<td>1</td>
</tr>
<tr>
<td>Figure 2</td>
<td>First moving assembly line, 1913</td>
<td>2</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Trend in lean publications, 1990 to 2014</td>
<td>3</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Global Green Brands, 2014</td>
<td>4</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Lean events in state agencies, 2003 to 2012</td>
<td>5</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Nine steps of a lean project</td>
<td>11</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Overview of the interview responses</td>
<td>14</td>
</tr>
<tr>
<td>Figure 8</td>
<td>Flow of the lean survey</td>
<td>18</td>
</tr>
<tr>
<td>Figure 9</td>
<td>Demographics of the lean survey</td>
<td>20</td>
</tr>
<tr>
<td>Figure 10</td>
<td>Lean participation barriers</td>
<td>20</td>
</tr>
<tr>
<td>Figure 11</td>
<td>Employee interest in lean seminar</td>
<td>21</td>
</tr>
<tr>
<td>Figure 12</td>
<td>Lean participation benefits</td>
<td>21</td>
</tr>
<tr>
<td>Figure 13</td>
<td>Environmental friendliness at PFD</td>
<td>22</td>
</tr>
<tr>
<td>Figure 14</td>
<td>Efficiency at PFD</td>
<td>22</td>
</tr>
<tr>
<td>Figure 15</td>
<td>Chi-square values</td>
<td>23</td>
</tr>
<tr>
<td>Figure 16</td>
<td>“Overview of Lean”</td>
<td>27</td>
</tr>
<tr>
<td>Figure 17</td>
<td>“Miami’s Lean Framework”</td>
<td>29</td>
</tr>
<tr>
<td>Figure 18</td>
<td>“Training Options and Advice”</td>
<td>31</td>
</tr>
<tr>
<td>Figure 19</td>
<td>Building services employees</td>
<td>33</td>
</tr>
<tr>
<td>Figure 20</td>
<td>Seminar feedback form</td>
<td>35</td>
</tr>
<tr>
<td>Figure 21</td>
<td>Table of recommendations</td>
<td>38</td>
</tr>
</tbody>
</table>
CHAPTER 1. BACKGROUND ON LEAN

1.1 WHAT IS LEAN?

The Lean Enterprise Institute refers to lean as a process that maximizes customer value while minimizing unnecessary, or “wasted,” resources (Lean Enterprise Institute 2015). Lean is a process efficiency technique; it provides a framework for continuous improvement and can be applied to many industries. Lean techniques are designed to eliminate waste from a variety of processes including production, management, customer relations, product design, and supply chains (Karim and Arif-Uz-Zaman 2013). In lean terms, waste includes unnecessary motion, waiting, inventory, transportation, a lack of employee involvement and creativity, overservicing, overprocessing, and product defects (Figure 1) (EnPower Group 2013). Waste elimination is achieved by optimizing product or service flow along entire value streams as opposed to optimizing individual technologies and tasks (Lean Enterprise Institute 2015). Improving entire processes, versus isolated points in the process, reduces the amount of necessary resources, such as employee and production time, and capital (Lean Enterprise Institute 2015). In other words, lean techniques create more value for customers using fewer resources.

![Figure 1 The 8 types of lean waste and their descriptions (EnPower Group 2013).](image)

1.1.1 LEAN HISTORY

Discussing the history of lean requires a look back at the innovators that embraced change and simplified processes. One of the first innovators credited with lean thinking was Eli Whitney who, in the early 1800’s, integrated interchangeable parts into his
production of muskets. While Whitney often receives credit for this lean innovation, interchangeable parts date back to the B. C. era under the rule of the Chinese emperor Qin Shi Huangdi. Huangdi used interchangeable parts to speed up crossbow assembly while on the battlefield (Iuga and Kifor 2013). In the early 1900’s, Henry Ford successfully implemented assembly flow lines and is credited with developing the first systematic approach to process flow (Figure 2) (Iuga and Kifor 2013). These improvements allowed Ford to produce the Model T quickly and consistently (Duque and Cadavid 2007). While turnover of inventory was Ford’s strength with the production of 7,000 Model T’s daily, variety was his weakness (Nicholas 2011). All Model T’s were exact replicates, except for the body style, which was added on as a last step in the production (Lean Enterprise Institute 2015).

**Figure 2** Photograph of the first moving assembly line for large-scale manufacturing. Photo taken at Ford Motor Company’s Michigan plant in 1913 (PBS 1998).

After World War II, the Toyota family improved upon Ford’s model of production by shifting optimization focus away from individual machines and workstations to overall product flow capable of offering wide variety. The outcome was a system titled Toyota Production System, or TPS. Hallmarks of TPS include reduced set up times, small batches, high employee involvement, low defects, preventive equipment maintenance, “just-in-time” production, and employee-created standard work (Nicholas 2011). This system became the prototype for lean production, also known as lean manufacturing.

1.1.2 LEAN SERVICE

Lean service is simply the application of lean methodologies in the service sector. Similar to the production sectors, lean service seeks to create predictable and repeatable outcomes, eliminate waste, and improve process flow (Locher 2013). In the early seventies, Theodore Levitt introduced the idea that lean production could be adapted to benefit the service sector (Suarez-Barraza, Smith and Dahlgaard-Park 2012). However, it was not until the mid nineties that “lean service” started to catch on as a viable process
improvement tool for service-based industries such as healthcare and education (Awwal 2014). Today, however, based on the number of publications regarding service sectors and lean methodologies, education has a declining trend while healthcare and financial sectors primarily have been increasing (Figure 3) (Awwal 2014). Research regarding lean in service sectors is thought to help facilitate implementation and improvement of lean processes (Awwal 2014).

Despite a lack of recent publications regarding the use of lean in the education sector, lean methodologies do stand to improve education as a service sector. Student demands on this sector are ever increasing. Not only is quality education important, students value updated residence halls, state-of-the-art learning facilities, and cutting-edge technology throughout it all (Comm and Mathaisel 2005). Increasingly, students are interested in campus sustainability ratings (Dautremont 2009). In 2008, The Princeton Review asked 10,300 people whether a school’s commitment to the environment would impact their willingness to apply to or attend the school. Around 23 percent of the respondents indicated such information would “strongly” or “very much” affect their decision; around 63 percent said they would value the information and it might impact their decision (Dautremont 2009). Not only must schools satisfy these varied demands, they must outcompete their competition in both quality and cost. Lean can be a tool to achieve these higher standards on minimal resources.

1.2 SUSTAINABILITY WITHIN THE PUBLIC AND PRIVATE SECTORS

In order to understand the role of sustainable development practices in the public and private sectors, one must first understand the concept of sustainable development. As defined in the Brundtland Commission Report sustainable development is “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development 1987).
For businesses, this means integrating the pursuit of economic gains with environmental wellbeing, and in today’s society, this shift is ever popularizing. Interbrand, a brand consultancy, in collaboration with Deloitte, a professional service firm, publishes an annual guide that identifies the top 50 global green brands (Figure 4). Making the list requires two things: a high degree of public perception of the brand’s sustainable practices and available data that marks the brand as a leader in sustainability performance (Interbrand 2014). For 2014, the top three green brands were Ford, Toyota, and Honda. In fact, Toyota and Honda both use lean methodologies to improve organizational environmental sustainability and achieve their ranking in the top three best global green brands (Maxwell et al. 1998; Interbrand 2014).

Market favorability is increasing for companies with strong environmental initiatives meaning that “greening” a company can potentially improve its profitability (Dahlstrom 2011). The US Environmental Protection Agency (EPA) reports that 73 percent of consumers favor companies with a history of making decisions that minimize harm to the environment (Environmental Protection Agency [EPA] 2009). Similarly, Roper Starch Worldwide, a marketing research firm, identifies 67 percent of consumers as having an appreciation for environmental ideals and will take that appreciation to the marketplace.
Along with attracting new consumers, greening a business is often associated with process efficiencies that are improved by lean methods. The integration of lean and green within the public and private sectors will be outlined in the following two sections.

1.3 LEAN AND GREEN IN GOVERNMENT AND COMMERCIAL SECTORS

Lean methodologies offer a framework for minimizing waste within a process, which can translate into maximizing environmental benefits while increasing profits. Many state environmental agencies have significantly increased efficiency and environmental gains by implementing lean methods (Figure 5) (EPA 2013b).

Lean has been adopted by state agencies as a response to external pressures such as

- Expanding environmental protection priorities
- Decreasing federal and state budgets;
- Competition in the form of process improvements from other state agencies; and
- New incoming leaders with a background in Lean methodologies (EPA 2008).

The outcome has been state agencies that simplify processes and respond faster while improving overall quality and reducing costs (EPA 2008). For example, between 2003 and 2006 Iowa’s Department of Natural Resources drastically reduced a permitting process from 23 steps to 7 steps and reduced the average lead time from 62 days to 6 days.
An EPA building in Denver, Colorado has realized yearly energy savings of $250,000 by shifting the working hours of janitorial staff from after business hours to during business hours and therefore, during daylight hours (Hudgins 2008).

Increased efficiencies and waste elimination can directly improve environmental quality. In 2010, EPA and four states used lean methods to evaluate the effectiveness of the region’s Clean Air Act State Implementation Plan (SIP) process (EPA 2013a). The SIP outlines how the State will achieve its primary and secondary National Ambient Air Quality Standards (EPA 2014). The outcome was a new SIP framework that will theoretically yield improvements including a lead time reduced by 56 percent, process steps reduced by 19 percent, number of decisions reduced by 43 percent, and freed employee time to address the region’s SIP backlog (EPA 2013a).

Within the commercial sector there is evidence that implementing lean initiatives can result in environmentally beneficial outcomes. For example, a Morgan and Stanley office building in New York realized $550,000 in annual savings after upgrading their central chiller system to a heating, ventilation and air conditioning (HVAC) system. The new system resulted in an energy savings and reduction of greenhouse gas emissions equivalent to planting 1.5 million acres of trees. By applying the lean strategy of investing in state-of-the-art technology, they increased building performance and reduced operating costs while also reducing energy demands and associated greenhouse gas emissions. Their local utility company also provided a $314,500 incentive for the building to reduce their electricity demand during peak hours (Hudgins 2008). In 2003, Dow Chemical installed an automatic “shut down” setting on employee computers that turned off computer monitors when not in use, saving the company a reported $2.5 million in one year (Varchaver, Lustgarten and Mero 2004). Between 2003 and 2005, Staples saved $6.5 million by installing sensors that control the lighting, heating, and cooling at 1,500 stores (Varchaver, Lustgarten and Mero 2004).

1.4 LEAN AND GREEN IN THE EDUCATION SECTOR

Lean methodologies can also produce process improvements in higher education (Comm and Mathaisel 2005). Similar to other sectors, education contains fixable inefficiencies such as excessive paperwork, isolated departments lacking critical information flow, cross-departmental redundancies, and slow processing times (Jensen 2013). Many universities also have a department responsible for the maintenance and construction of their infrastructure. These departments are similar to the industrial sector and stand to benefit from similar lean process improvements such as increases in productivity, energy efficiency, and environmentally friendly waste management solutions. Many lean tools can be considered sustainability tools because they solve problems by eliminating waste at its source, as opposed to simply diverting it post generation (Jensen 2013). Eliminating
the production of unneeded resources can also increase profits. Therefore, the use of lean methodologies can increase the environmental and economic sustainability of an educational organization (Jensen 2013).

1.5 LEAN AT MIAMI UNIVERSITY

Miami University (Miami) began utilizing lean strategies in 2009 as a response to the economic crisis and widespread reduction of state funds (Krehbiel, Ryan and Miller 2015). Miami defines its approach to lean as a process to “improve quality, responsiveness, productivity and reduce costs by analyzing the work and finding ways to improve it” (Miami University 2015). Miami has adapted lean service methodologies resulting in a unique framework for continuous improvement.

All Miami employees have access to both lean training and portals to submit lean ideas (Miami University 2015). Lean ideas must satisfy one or more of Miami’s “breakthrough objectives”, or goals that Miami has identified as priority outcomes of a given project. The “breakthrough objectives” include:
- Increase revenue
- Improve productivity
- Reduce costs
- Cost avoidance
- Continue and improve “green” initiatives (Miami University 2015).

Submitted lean ideas are reviewed by a steering team. Selected projects fall into one of two categories: just-do-it or complete project. Ideas eligible for just-do-it classification are deemed straightforward enough to be accomplished by one person who can just “do the work.” For complete projects, the steering team selects the team leader and project sponsor, and the project’s deliverables. The steering team and the team leader then select the team members, usually around six to eight people. Lean projects take on average 6 months to complete.

Miami’s lean projects have accounted for over $27 million in annual economic impact, with 35 percent of those projects fulfilling the environmental initiative (Krehbiel, Ryan and Miller 2015). Green projects have included process improvements that reduce or eliminate paper, and reduce energy usage and hazardous waste production. One example comes from the Department of Housing, Dining, Recreation and Business Services where a lean team improved a process related to their custodial services. After various modifications the result was a process that used 20 percent less chemicals and saved $3 million over two years (Krehbiel, Ryan and Miller 2015).
Miami encourages its employees to become lean trained. There are various training options for employees including the lean 2-Day training and intro seminars offered by individual departments. The 2-day training examines the entire lean process from developing lean ideas to completing lean projects. The intro seminars offered at the departmental level typically last thirty minutes to an hour and must be offered by an employee within the specific department.

As of February 2015, Miami had over 1400 employees trained in lean practices and more than 150 teams working on lean projects (Krehbiel, Ryan and Miller 2015). However, Miami has set a goal that all employees trained in lean practices by 2020 (Krehbiel, Ryan and Miller 2015). With around 4100 faculty and staff members at the university, outreach efforts and training opportunities are still needed to achieve the 2020 goal.

1.5.1 LEAN IN THE DEPARTMENT OF PHYSICAL FACILITIES

Miami’s Department of Physical Facilities (PFD) is responsible for the construction and maintenance of all administrative and academic buildings on campus, which equals approximately 7.5 million square feet of building area. PFD also maintains all campus grounds, including 32 miles of walkways, 76 acres of parking areas, and 9000 trees (Physical Facilities n.d.). The department employs around 350 people who work in one of the following six sub-departments:

- Administration,
- Planning, Architecture and Engineering,
- Buildings and Grounds,
- Operations Center,
- Building Maintenance, and

Lean was introduced to PFD in early 2012 under the leadership of Al Ryan, Director of Lean Initiatives. Soon after, a department lean leader was appointed, a steering committee formed, and projects quickly prioritized and assigned (Miami University 2014). As of July 2014, Physical Facilities had earned or saved nearly $4 million worth of cost-avoiding, cost-reducing, and revenue-generating projects.

PFD is also responsible for various lean projects that improve both environmental and economic initiatives (Miami University 2014). In 2012, a PFD lean team completed a project that saves the university over $60,000 in annual energy usage through the installation of variable air volume (VAV) boxes controlled by occupancy sensors. These systems regulate the amount of conditioned air that flows into classrooms based upon classroom use. PFD also developed an in-house energy team that continuously finds ways
to optimize energy performance within Miami’s buildings, resulting in lower energy consumption and increased savings (Miami University 2014). Another lean team from PFD helped to “right-size” PFD’s fleet. Having too many vehicles or sending the wrong size vehicle to perform a task is not efficient. The team worked to determine the minimum number and size of vehicles needed, thereby lowering operating costs and reducing greenhouse gas emissions.

Lean methodologies can help organizations become more efficient, reduce costs, and increase their overall environmental sustainability. At Miami, lean has aided in the realization of all three elements. While Miami’s lean program has grown since its inception in 2009, there is still room for growth and improvement.
CHAPTER 2. LEAN AND GREEN AT THE DEPARTMENT OF PHYSICAL FACILITIES

2.1 PRACTICUM DESCRIPTION

The Department of Physical Facilities at Miami University seeks to strengthen its lean culture. PFD has already developed strong lean leadership among its administrative staff and has many lean leaders embedded throughout the sub-departments. Now, PFD’s administrators would like to see an increase not only in lean ideas, but those associated with environmental sustainability initiatives. Therefore, a key objective of this practicum was to improve PFD employee knowledge and engagement with Miami’s lean program and sustainability initiatives, particularly for employees with no lean training. To improve participation in the lean program, I focused on the following three objectives:

1. Become familiar with the lean program and employee involvement at Miami and PFD;
2. Identify employee benefits and barriers to participating in lean; and
3. Develop an introductory training seminar on PFD’s lean and green programs.

The clients for this practicum are
- Cody Powell, Vice President of Facilities, Planning, and Operations, PFD
- Yvette Kline, Director of Sustainability and Energy Systems, PFD
- Jeremy Davis, Senior Department Lean Leader, PFD

2.1.2 PRACTICUM SIGNIFICANCE

PFD is responsible for the design, construction, and maintenance of many of the buildings and all the grounds at Miami. “Greening” the department has the potential to greatly impact the sustainability of the university and its progress toward its sustainability goals. Effective creation and implementation of projects that minimize environmental impacts require the people on the project to be aware of its environmental factors (Maltzman and Shirley 2011). This practicum is intended to bring awareness to PFD’s employee base regarding the administrative staff’s commitment to lean and green initiatives and encourage employee participation in the initiatives.

2.2 LEAN 2-DAY TRAINING SEMINAR

I participated in the 2-day lean training to become familiar with Miami’s lean framework and to gain tools and develop ideas that could be incorporated into my communications with PFD employees. The training described how and why lean came to be at Miami and provided detailed instructions on how to identify lean ideas and complete lean projects.
The training also incorporated group work and group discussion throughout. This was especially helpful while discussing the various types of lean “waste” (Figure 1), allowing for everyone to identify and share stories of the inefficiencies in their daily tasks. Being able to identify non-value added tasks, i.e. lean waste, is paramount for identifying good lean ideas and participating on lean projects.

Under Miami’s lean framework, lean projects follow a series of steps to reach their end goal (Figure 6). The training emphasized the importance of the seventh and eight steps: Identify Current State and Create Future State and Implementation Plan. The current state is defined as “the way things are now” before any changes are implemented. Often a flow chart is created mapping out every step of the current state, aka to “walk the process.” From there, team members identify the non-value added steps. The team then determines the optimal way to eliminate the non-value added steps from the process and develops a flow chart for the future state. Once the future state is established, an implementation plan is created which includes a strategy for training other employees. To aid in employee training and ensure consistent implementation of the future state, the team composes a write-up of the new work process; this step is called developing “standard work.” If the standard work document is efficiently developed, it will allow virtually anyone to complete the new process.

2.3 METHODOLOGY

To reach my basic goal of increasing employee awareness and interest in the lean program, I first needed to identify the barriers preventing employee participation as well as the benefits. To accomplish this I conducted interviews with PFDs lean participants and a PFD employee-wide survey. Interviews were used to answer specific questions
about the challenges and achievements of interviewees’ lean journeys, while the surveys
offered insight as to common barriers experienced by employees that do not participate in
lean. For employees without lean training, I developed a one-hour introduction to lean
seminar titled “Lean and Green at PFD.” Lastly, I led the seminar, training PFD
employees how to identify and submit lean ideas. The human subjects research for the
practicum was certified by Miami’s Research Compliance Office and exempted from
further IRB review (reference number 01391e).
CHAPTER 3. UNDERSTANDING CURRENT PFD EMPLOYEE INVOLVEMENT AND PERCEPTIONS

Based on information provided by Miami’s Office of Lean Initiatives, around two-thirds of PFD employees have no formal lean training. Understanding the barriers of opting into the lean program, and the benefits of doing so, was important to developing a lean training that would attract PFD employees. My strategy for determining the barriers and benefits to participating in the lean program was to interview lean participants at PFD and survey all of PFD’s employees. The interviews provided an in depth look into the lean journeys of the interviewees, including challenges faced, benefits received, involvement in environmentally friendly projects, and advice for non-lean participating employees. The survey was a helpful tool for getting a more representative understanding of these aspects.

3.1 INTERVIEWS

PFD employs over 300 people, working in various trades and encountering a multitude of processes and potential process inefficiencies. My goal was to capture insights from several employee groups so as to obtain a more holistic understanding of employee perception of PFD’s lean program. To determine whom to interview, I met with PFD’s Senior Lean Leader, Jeremy Davis. Mr. Davis provided a list of ten potential participants with varying levels of lean involvement, from lean leaders to those who have completed one training. I felt this was an important distinction as motives and barriers for participation might be different for employees that are lean leaders, or on their way to being, versus employees currently interested in the minimum lean involvement. I selected six employees to interview including women, men, leaders and participants.

3.1.1 INTERVIEW METHODS

Interviews were semi-structured, following a set of pre-determined open-ended questions. This format allowed for additional follow-up questions and provided participants the opportunity for other lean topics to emerge. Interviews were conducted face-to-face in the interviewees’ office and lasted an average of 20 minutes. Interviews were recorded, and transcribed verbatim, with the exception of two, which were recorded by hand per the requests of the individuals.

I developed four main interview questions based on client meetings and my lean 2-day training:

1. Have any ideas you submitted or teams you have been on involved “green” components? If so, can you please describe the ideas and/or projects?
2. What have been your challenges or barriers during your lean journey? Can you give specific examples, especially from projects that have had “green” components?

3. What have been your achievements or successes during your lean journey? Can you give specific examples, especially from projects that have had “green” components?

4. What advice would you give to employees that are interested in becoming lean participants?

Responses were analyzed by reading through the transcribed text to identify themes or “fundamental concepts” (Ryan and Bernard 2003). Themes in the responses were developed inductively from the transcribed text for each interview question. Theme identification was checked for reliability, or agreement on how the themes were applied to the data, by my advisor, Dr. Sarah Dumyahn (Ryan and Bernard 2003).

3.1.2 INTERVIEW RESULTS

Various themes were identified for each question and are highlighted in Figure 7. Themes and their identifiers will be explained in the following paragraphs, organized by interview question.

<table>
<thead>
<tr>
<th>Question 1: Have any ideas you submitted or teams you have been on involved “green” components?</th>
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<tbody>
<tr>
<td>Themes</td>
</tr>
<tr>
<td>Paper reduction; All other responses were unique</td>
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<tr>
<th>Question 2: What have been your challenges or barriers during your lean journey?</th>
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<tbody>
<tr>
<td>Themes</td>
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<tr>
<td>Time; Team member commitments to teams; Organizational trust</td>
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<th>Question 2.1: I overcome the barrier of time by...</th>
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<tbody>
<tr>
<td>Themes</td>
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<tr>
<td>Time management; Focus; Reflect; Kaizen events</td>
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<tr>
<th>Question 3: What have been your achievements or successes during your lean journey?</th>
</tr>
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<tbody>
<tr>
<td>Themes</td>
</tr>
<tr>
<td>Improve university efficiency; improve “greenness” of campus; Time management; Improve customer satisfaction; Job security</td>
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<th>Question 4: What advice would you give to employees that are interested in becoming lean participants?</th>
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<tbody>
<tr>
<td>Themes</td>
</tr>
<tr>
<td>Don’t fear lean; Lean is a learning opportunity; Be open to change; Participate in the lean program</td>
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“Have any ideas you submitted or teams you have been on involved “green” components? If so, can you please describe the ideas and/or projects?”: All the interviewees indicated they had been involved in lean projects that included
environmental components. Two of the individuals were on teams that reduced paper consumption, while the other four participated in teams on all different topics including ones to reduce fuel consumption, increase energy efficiency, improve outdoor recycling, and construct LEED buildings.

“What have been your challenges or barriers during your lean journey? Can you give specific examples, especially from projects that have had “green” components?”: Three themes were identified for this question: time, team member commitments to teams, organizational trust. For the theme of time, the identifiers were phrases such as “lack of time,” “barrier is time,” “no time to reflect,” “not enough time.” Five of the six interviewees indicated time as a barrier. For the theme of team member commitments to teams, the identifiers were phrases such as “need team member buy in.” One interviewee indicated the lack of team member buy in to teams as a barrier. For the theme of organizational trust, the identifiers were phrases such as “lean is about eliminating jobs” and “fear of change.” Two interviewees indicated lack of organizational trust as a barrier.

Because the barrier of time was felt so strongly by the interviewees, many of them offered their solution to the problem. This organically became its own question with themed responses.

“I overcome the barrier of time by…”: Four themes were identified: time management, focus, reflect, kaizen events. Two interviewees indicated they use time management tools such as setting meetings in advance and putting meetings on calendars. Two interviewees emphasized the importance of focusing on the task at hand to overcome the time barrier. One indicated that taking time to reflect on your work could increase your ability to correct any errors you may have committed. One interviewee indicated that hosting kaizen events for a project, while time intensive to prepare for, can reduce the overall time spent on a lean project.

“What have been your achievements or successes during your lean journey? Can you give specific examples, especially from projects that have had “green” components?”: Five themes were identified: improve university efficiency, improve “greenness” of campus, time management, improve customer satisfaction, job security. Four interviewees indicated that they were able to improve the efficiency of the university through lean projects on which they had worked. Indicators for this theme included phrases such as “improve processes,” “less waste,” “standard workflow with predictable outcomes,” and “root cause analysis.” Three interviewees indicated that by working on lean projects, they had made processes at the university more environmentally friendly. Indicators of this theme included phrases such as “university is
exceeding ‘green’ goals,” “eliminating waste in a ‘green’ way,” and “lowering energy costs.” One interviewee indicated their ability to manage time effectively improved as a result of participating in lean; they were made aware of time management tools to help aid this barrier. Three interviewees were able to increase customer satisfaction as a result of a lean project. Key phrases for this theme included “customer centric” and “employee centric.” One interviewee felt that lean is a tool that increases job security; if the university is remaining competitive, and retaining and growing their customer base, then it will continue to need employees.

“What advice would you give to employees that are interested in becoming lean participants?”: Four themes were identified: don’t fear lean, lean is a learning opportunity, be open to change, participate in the lean program. Three interviewees advised non-lean participating employees not to fear the lean program; it is not at Miami to eliminate jobs, as many might think. Indicators for this theme included “not about eliminating jobs” and “have an open mind.” One interviewee suggested employees should embrace lean, especially if they are interested in learning new perspectives about their department and the university. The indicator for this theme was “opportunity to learn about the university.” Two interviewees advised non-lean participating employees to be open to change. The indicators for this theme included “don’t take change personally,” “change can improve your work,” and “try different things.” As one interviewee said, “if you’re not changing, you’re falling behind, and if you’re going to fall behind, then we’re not going to be here.” Three interviewees recommend employees to start participating in the lean program. Participation can start either with a lean training, such as the 2-day, Intro to Lean, or Senior Lean Certification Program, or by submitting lean ideas. Indicators for this theme included “get lean trained” and “submit lean ideas.”

3.1.3 INTERVIEW DISCUSSION

Overall, two broad aspects of the interview data can be used to better understand lean and improve the experience of lean participants at Miami: the value of lean and lean advice to non-lean participating employees. All interviewees essentially agreed being involved in lean projects is time consuming; however, they all empirically understood lean to be a tool to improve daily and systemic efficiency. The interviews also revealed a strong belief that employees without lean training might think of lean as a job elimination tool and avoid involvement as an employment preservation tactic. However, all interviewees emphasized that lean is not about eliminating jobs. In fact, lean secures jobs by increasing the value to dollar ratio for students thereby increasing enrollment and the necessary staff to support the system. Half of the interviewees recommended that employees do not just take their word, but see for themselves, that lean is about process improvements and not job elimination. These interviewees encouraged non-lean participating employees to sign-
up for a lean training, get to know the facts, and become a change agent for success and improvement.

3.2 SURVEYS

I conducted a department-wide survey to better understand the collective barriers and benefits of the lean program at PFD. One key element of the survey was to gain a broader perspective of the perception of lean from both lean participating and non-participating employees. The online survey was anonymous and individual responses were kept confidential. Confidentiality was ensured to encourage candid and honest responses to questions, without individuals’ fear of repercussions.

3.2.1 SURVEY METHODS

I developed the survey questionnaire based on research, meetings with clients, and insights gained from my 2-day lean training (Appendix I). Research included a case study seeking to understand if and how academic institutions utilize process efficiency methodologies as a way to become leaner and more sustainable (Comm and Mathaisel 2005). The study surveyed 18 institutions, asking a variety of questions, including two that inspired four of my survey questions:

- “What degree of ‘sustainability’ do you believe your organization has achieved?”
- “What degree of ‘leaness’ do you believe your organization has achieved?”

(Comm and Mathaisel 2005).

I used these two questions, almost verbatim, in the survey. These two questions also inspired the following two survey statements that called for respondents to indicate their level of agreement:

- I think some of the processes in my job could be more efficient.
- I think some of the processes in my job could be more environmentally friendly.

The questionnaire included a variety of Likert scale, fixed, and open-ended responses. Because some PFD employees have lean experience and some do not, my questionnaire had a branch at the second question: “Are you involved in Lean at Physical Facilities?” This was the only question that could not be skipped without ending the survey. “Yes” responses proceeded to one block of questions; “No” responses proceeded to another (Figure 8). The branch allowed me to ask different questions to the two groups of respondents. For instance, to employees that did not have lean experience, I was able to elicit a response as to the barriers that keep them from getting involved with the following question:

- What challenges exist that keep you from getting involved in lean projects?
This question, and the next, had fixed responses, of which the respondent could pick multiple, and there was an option for “other” to capture information not contained in the pre-determined response options. For employees with lean experience, I wanted to know the benefits of involvement; I elicited a response through the following question:

- What have been your achievements or success during your lean journey?

I also included two questions regarding the length of time the respondent has been employed at Miami and PFD. I chose to include this question to evaluate a potential link between length of time at Miami and disposition for or against the lean program.

![Diagram](image-url)

**Figure 8** Diagram illustrating the flow of the survey. A branch was used at the second question whereby “No” responses went one way and “Yes” responses went another. Bolded questions were asked of both groups and their responses were aggregated and evaluated as a whole.
I used Miami’s survey tool, Qualtrics, to generate and run my survey. I piloted the survey among a similar group of Miami employees. I received 18 responses during the pilot phase, all of which indicated the survey questions were without ambiguity. I then submitted the questionnaire to Yvette Kline, Miami’s Director of Sustainability and Energy Conservation, to review for validity and reliability.

Following a modified Tailored Design Method, I used multiple contacts through email with potential participants to improve the response rate and accuracy of the survey results (Dillman, Smyth and Christian 2009). On three separate dates (December 18, January 7, January 29), I sent an email to all 336 PFD employees requesting participation in the survey and provided access to the survey via an embedded link (Appendix II). In an attempt to boost participation, I included a lean endorsement from a widely known and well-respected PFD employee in my first email. This is an example of a community-based social marketing tactic, social diffusion, used to increase participation in a program (McKenzie-Mohr 2011). I received responses from 94 people, or 28 percent of PFD employees.

3.2.2 DATA ANALYSIS

The survey data were exported from Qualtrics and analyzed in Microsoft Excel. All but four questions were analyzed separately for lean participants and non-participants. For the four questions where all respondents answered, the results were analyzed for PFD employees as a whole. A chi-square statistical analysis test of independence was also performed on these four questions, observing potential trends in responses between lean trained and non-lean trained employees. The chi-square tests were performed in Microsoft Excel.

3.2.3 SURVEY RESULTS

In this section I will provide an overview of the survey results. A complete analysis of the results, by question, can be found in Appendix III. As mentioned above, at the time of the survey PFD had 336 employees. Responses totaled 107; however, 13 of those were incomplete, leaving 94 viable responses.

Below is a figure of the demographic data for the respondents (Figure 9). Of the employees with lean experience who disclosed their time at Miami (n=85), 44 percent have more than 10 years at the university while 56 percent have 10 years or less. For employees without lean experience, 63 percent have more than 10 years at the university while 37 percent have 10 years or less.
<table>
<thead>
<tr>
<th>Number of respondents who disclosed years of experience</th>
<th>Total number of survey respondents</th>
<th>Average time at Miami &gt; 10 years</th>
<th>Average time at Miami &lt;= 10 years</th>
</tr>
</thead>
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<tr>
<td>Employees with lean experience</td>
<td>61</td>
<td>24</td>
<td>31</td>
</tr>
<tr>
<td>Employees without lean experience</td>
<td>33</td>
<td>19</td>
<td>11</td>
</tr>
</tbody>
</table>

**Figure 9** Basic demographic data for the lean survey respondents.

Employees without lean experience have various reasons for not becoming lean participants (Figure 10). The two most prominent are the lack of training options and time to participate in additional projects. Another common reason was employee distrust of the lean program; this was reflected in the open-ended responses to “Other.” Indicators of this theme included “lean is a scam” and “don’t want to participate.”

![Figure 10](chart.png) **Figure 10** Chart of the barriers to participating in PFD’s lean program. The y-axis is the barrier; the x-axis is the percent of respondents who selected the barrier. n=32.

Respondents that did not have lean training were asked about their interest in attending a lean training seminar as part of their normal paid workday (Figure 11). Of the 32 respondents to this question, 24 indicated they would be interested in such an opportunity.
Employees with lean experience reported that they benefitted from the program (Figure 12). Over half of these respondents indicated they gained knowledge, improved Miami’s sustainability, and developed new connections with coworkers as a result of their participation in the lean program.

Respondents were asked to weigh in on how environmentally friendly their work is, on a day-to-day basis (Figure 13). Almost half of the respondents indicated that their daily tasks could be more environmentally friendly. Only 13 percent of respondents didn’t think their work could be more environmentally friendly.
Respondents were also asked to weigh in on the efficiency of their daily work (Figure 14). Nearly 75 percent of those surveyed indicated their jobs could be more efficient. Only 6 percent indicated their jobs could not become more efficient.

I performed a chi-square test of independence on the four questions that were asked of both groups (Figure 15). I was interested in identifying potential trends in the responses, particularly if the two groups’ responses were significantly different. When performing a chi-square test, data are considered “statistically different” if the chi-square value is below 0.05. Test results for the four survey questions indicated that the answers of the
two groups of employees, lean trained and non-lean trained, were not statistically different.

<table>
<thead>
<tr>
<th>Chi-Square Test of Independence</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>“I think some of the processes in my job could be more efficient.”</td>
<td></td>
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<tr>
<td>Chi Square Value</td>
<td>0.918</td>
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<tr>
<td>“I think my daily tasks could be more environmentally friendly.”</td>
<td></td>
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<tr>
<td>Chi Square Value</td>
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<tr>
<td>“What degree of environmental friendliness has Physical Facilities achieved?”</td>
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<tr>
<td>Chi Square Value</td>
<td>0.069</td>
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<tr>
<td>“What degree of Leanness has Physical Facilities achieved?”</td>
<td></td>
</tr>
<tr>
<td>Chi Square Value</td>
<td>0.174</td>
</tr>
</tbody>
</table>

**Figure 15** Table of the chi-square test of independence. Results indicate the two groups are statistically similar. Any observed differences are the result of random chance.

### 3.2.4 SURVEY DISCUSSION

Of PFDs 336 employees that received a survey email, 94 had been lean trained and 242 had no lean training. From these two groups, 46 percent of lean trained employees participated in the survey, while 21 percent of employees with no lean training participated. Therefore, my results likely represent the average opinions of lean trained employees, but it is possible that results for untrained employees are not adequately represented in this survey. The interactive portions of the seminar and the participant feedback survey, discussed in Chapter 4, were good tools for further understanding the opinions of employees without lean training regarding PFDs lean program. In fact, the seminar discussions and feedback survey results reinforced results from non-lean trained employees who participated in the employee-wide survey.

Supporting the claim that the employee-wide survey results are adequately representative of PFDs general population are the chi-squared tests that indicate the responses of the two groups are statistically similar and the results from the Comm and Mathaisel (2005) case study, which were similar to PFDs survey results. In the case study, the researchers surveyed 18 universities; their results indicated that employees of their respective universities perceived its efforts towards both sustainability and lean to be around 3.5 on a 4-point scale with 4 being “very sustainable/lean” and 3 being “progressing toward” (Comm and Mathaisel 2005). This is similar to the PFD survey where the majority of respondents, from both groups, selected 4 on a 5-point scale for both answers, also in the middle of “very environmentally friendly/lean” and “progressing toward.”
The PFD survey results also suggest that employees have the foundation for becoming active lean participants because they think critically about their work and see the inefficiencies and areas for improvement. The only hurdle that really exists is empowering these employees with the knowledge of the lean program and how to participate. These barriers were reflected in the survey, as shown in Figure 9. Once employees have the tools and feel confident enough to participate in the program, they need to be given time to participate. Time was the largest barrier in the survey for employees that do not currently participate in the program. Conversely, lean can create time in jobs by making processes more efficient. It stands to reason that if employees participate in the program, additional time to participate will increase, as their daily works becomes more efficient and less time consuming.

3.3 DISCUSSION

The interviews and survey were intended to inform my project on a variety of important topics. Of the barriers to participation, I was surprised and encouraged that 28 percent of respondents do not participate simply due to a lack of available training options. I was further encouraged that the large majority of these employees would attend a lean training seminar, should one be made available. This is a positive outcome; it will be easier to engage employees in lean simply by making training options available, as opposed to extensive outreach campaigns followed by training opportunities.

The interviews and survey revealed a unanimous barrier and challenge to participating in the lean program: lack of time. For both, this barrier/challenge was the most frequently stated among employees. Interviews suggested that overcoming this barrier could be done with diligent organizational skills and being prepared in advance of lean meetings. Organizational tools are also taught in various lean training seminars.

The interviews and survey also suggested that employees believe lean to be a tool that can increase the university’s efficiency and environmental friendliness. This is an important point as the majority of PFD employees indicated their daily tasks could be more efficient and environmentally friendly. From this I gathered the lean training would need to clearly identify the eight types of inefficiencies and how to develop and submit suggestions for their improvement.
CHAPTER 4. LEAN AND GREEN OUTREACH TO PFD EMPLOYEES

PFD has a goal to have 100 percent of their employees exposed to lean training by the end of 2015. As proposed by the clients, the one-hour training seminar is the tool to bring lean training, with an emphasis on green initiatives, to the remainder of PFD employees without such training. My task was to develop the seminar.

Insight gained from client meetings, the lean 2-day training, interviews, and survey responses guided the development of the first iteration of the “Intro to Lean and Green at PFD” training seminar, developed in Microsoft PowerPoint. Through participant and client feedback, I was able to further craft a seminar that met the needs of employees, emphasizing areas of interest and eliminating unnecessary information. This chapter showcases the third iteration of the seminar with a detailed explanation of its creation, my experiences giving the seminar, and how they shaped the final version.

4.1 DEVELOPING THE ONE-HOUR TRAINING

Based on client meetings, I knew PFD management wanted the outcome of this project to include an increase in lean idea submissions, especially ones that furthered PFDs interest in becoming more environmentally friendly. Therefore, the presentation needed to include the following components:

• Examples of “green” lean ideas and projects
• Tutorial on developing lean ideas
• Instructions on how to submit lean ideas

Interview and survey responses implied that employees are not involved in the lean program due to a misconception of its purpose and shortage of available time in the workday. Therefore, I also wanted the presentation to clearly communicate the true value of lean and quick and easy ways to participate.

I was given access to two “Intro to Lean” presentations, one from the Office of Lean Initiatives and one from PFD. The Office of Lean Initiatives has a two-hour presentation providing extensive information regarding lean methodologies and their use at Miami. The presentation provided by PFD is intended to last around thirty minutes and gives participants a snapshot view of Miami’s lean program, focusing on the five “breakthrough” objectives and lean project examples. However, in developing “Intro to Lean and Green at PFD” I mainly called upon my experiences from the two-day lean training. I liked the group work component; I felt working in groups aided in the development and synthesis of ideas and information. Therefore, I have two distinct group discussion/group work components in the presentation. I also modified the presentation after each seminar based on my experiences giving the seminar and participant feedback. The presentation described in the following sections is the current version.
The presentation is organized into three sections: overview of lean, Miami’s lean framework, training options and advice. In the overview of lean section, I emphasize that lean is about organizational improvement and is a tool that can enhance employee control over their daily work. I start with this concept as a response to the perceived participation barrier that the intent of lean is to eliminate jobs. By introducing this concept initially and providing evidence throughout the seminar, I tried to develop a positive and engaging tone to the presentation. Then I outline certain details of Miami’s lean program and end with an overview of the lean 2-day training and advice from lean trained employees. The full presentation can be found in Appendix IV.

4.1.1 SECTION ONE: OVERVIEW OF LEAN

Miami’s vision, as stated in its 2020 plan, is to “provide the best undergraduate experience in the nation, enhanced by superior, select graduate programs” (Miami University 2013). To accomplish this vision in a manner that optimizes the value to cost ratio, Miami adopted the lean program. A successful lean program requires that all employees are participating by identifying areas for improvement and creating and implementing the necessary changes. The Overview of Lean section is intended to explain the purpose of lean, how it came to be at Miami, and how employees can use it to their benefit (Figure 16).
I begin the seminar on slide two by stating Miami’s vision, to provide the best undergraduate student experience in the country. I elaborate on the slide by discussing the similarity between this vision and the vision of most companies, which is to be the best in their field. In that way, Miami is not unlike any other business; it is looking for opportunities to optimize processes, reduce costs, and invest savings back into new programs and services.
Slide three gives proof of Miami’s written commitment to enhance the employee experience through a dedication to lean training. Here “continuous improvement” is a synonym for lean. I mention that PFD also has a goal to have 100 percent of its employees exposed to lean training by the end of 2015. PFD has this goal because management knows there is room for improvement, and so do employees. The lean survey revealed that over 70 percent of respondents felt their daily work could be more efficient.

Slide four is an overview of the remainder of the presentation. Slide five discusses the history of the lean program at Miami. Lean came to the university in 2009 after the economic crisis, which, according to Mr. Ryan, prompted the university to lose millions in state funding. In the six years since the program first appeared, over 1400 employees have been trained and at PFD, millions have been saved. However, there is still room for improvement and the potential for Ohio public universities to have future tuition freezes or reductions make lean initiatives all the more necessary (Kasich 2015).

Slide six identifies other schools that have also implemented lean methodologies. Mr. Ryan has indicated that Miami is a leader among universities using lean. Many universities have reached out to Mr. Ryan for guidance in developing and implementing similar programs at their locations.

Slides seven and eight shift the focus away from how lean benefits the university to how it benefits employees. In slide seven I discuss how lean empowers employees to make changes in their individual work tasks. I give an example from my job as Sustainability Education Coordinator of a task I do that is very inefficient. I explain why the task is a perfect lean opportunity; applying the lean framework to this task would save the university money and me hours in my day. In slide seven I discuss the lean survey results and the benefits identified by lean participants.

4.1.2 SECTION TWO: MIAMI’S LEAN FRAMEWORK

One key aspect of lean that Miami has utilized is the identification of waste. This section of the seminar teaches participants about the types of lean waste, Miami’s lean objectives, and how to submit a lean idea (Figure 17). The lean program at Miami has been adapted to meet its individual needs. Miami has identified objectives that lean ideas must meet and developed a unique system of submitting ideas.
Figure 17 Slides 10 through 19 of the one-hour training seminar. These slides represent the “Miami’s Lean Framework” section of the seminar.
Slide 10, in Figure 17, identifies the seven types of lean waste. This is the first interactive portion of the seminar. I go through the individual wastes, reading and explaining the definitions, and eliciting examples from the group. If the group cannot think of examples, I am ready with examples of each waste from their jobs. For this reason, it was helpful to do the pre-work of discussing with an appropriate manager the types of jobs and potential wastes the employees encounter throughout the day. At the end of the slide I reveal an eighth waste, lack of employee creativity and involvement. In fact, lean hinges on this eighth waste; if employees do not buy into the program, suggesting lean ideas and sculpting their outcomes, it cannot thrive. Slide 11 defines a few more highly used lean vocabulary words. If participants are interested in getting involved in the program, knowing these four words will be helpful.

Slide 12 identifies Miami’s “breakthrough” objectives. Every lean idea must satisfy at least one of these objectives. Slides 13 through 16 give examples of lean projects that both meet the specific objective and represent a green initiative.

Slide 17 is a group activity that gives participants the experience of developing lean ideas. Participants split into groups of three to four and come up with four lean ideas, one of which must fulfill the environmental objective. They place the ideas into the Project Identification Matrix that divides projects into four categories: high return/easy to implement, high return/difficult to implement, low return/difficult to implement, low return/easy to implement. The matrix is a tool to help participants think about the overall value of their potential lean ideas. Once complete, teams elect a spokesperson to share the ideas with the room. This activity is also conducted during the two-day lean training.

Slide 18 instructs participants where to find the online portal to submit lean ideas. The name of this portal is “I have a lean idea!” A screenshot of the lean idea submission page is featured on slide 19. I included the screenshot to demonstrate the lean idea submission process.

4.1.3 SECTION THREE: TRAINING OPTIONS AND ADVICE

Because the training is limited to one hour, a lot of information regarding the selection process for lean ideas, development of lean teams, and steps of a lean project is not included. While this information is important, it is outside the scope of interest for participants that have no lean training and still may be hesitant regarding lean participation. Instead of weighing down the presentation with excess information, I have included the Training Options and Advice section (Figure 18) where I encourage individuals to consider taking the 2-day training seminar if they are interested in learning more about lean. I have completed the 2-day training and in slide 21 I provide a quick yet detailed summary (Figure 18).
Slide 22 is a compilation of advice from interviews and survey responses. This slide represents an attempt to apply social diffusion tactics to boost participation. Social diffusion is the theory that information received from familiar sources such as friends, coworkers, and trusted people, have an influence on our decision-making process (McKenzie-Mohr 2011). During this slide, I mention that quotes are compiled from peers at PFD that have been through the lean process.

Slide 23 is from the “Intro to Lean” PowerPoint provided by PFD. I included it because it quickly summarizes the immediate steps an employee can take to contribute to the lean program.

4.2 TRAINING PFD EMPLOYEES

From February to March 2015, I was able to complete three PFD one-hour training seminars. A total of 24 employees participated in the three sessions. All three sessions took place in separate locations. PFD employees work all over campus; they do not all convene in the same place throughout the day. While this could add a level of difficulty for some, for me it did not. My availability and mobility were very adaptable to the needs of participants.

4.2.1 TRAINING ONE

The first training took place on February 20, 2015 at Miami’s Steam Plant. I trained three employees while a manager observed. During this training I realized the importance of
knowing the audience and the types of lean wastes they contact throughout their day. Because the manager was present, he was able to personalize the “Types of waste: TIMWOOD” slide with relevant examples; this in turn generated a valuable discussion. For instance, while discussing the waste “Inventory” an employee mentioned the steam plant stores a replacement item for a piece of equipment even though it is only replaced at most once per year. The reason is that if this component fails to work, it needs to be replaced immediately; therefore, they always have one in their inventory. However, we discussed that keeping more than one in stock would become a lean “waste.”

The three employees were most interested in learning how lean can be used to modify and sculpt their jobs. The employees were also pleased to learn they can submit lean ideas on a job they do not do, but know of improvements.

For all subsequent trainings, I spoke with a manager from the group of employees whom I would be training to learn about the types of lean waste they come into contact with on a regular basis. One of these managers, from Building and Grounds, shared an interesting lean fact- if one employee develops a lean idea that reduces a process time by just one minute, this change, spanned to all Buildings and Grounds employees, can save the department $10,000 per year. This example is meant to show the value of all lean ideas, even the ones that seem small.

4.2.2 TRAINING TWO

The second group to participate in the training included seven employees from Building Services. This training took place on February 26, 2015 in the lean training room at Laws Hall. Similar to the previous group, employees were most interested to learn that lean is their tool to suggest changes and improvements in how they do their jobs.

From this group, I learned the importance of keeping participants focused on the topic at hand. The participants tended to ask off-topic questions that would be answered later in the presentation but for their early inquiries. In an attempt to please the participants, I responded to these questions, thereby rendering a disjointed presentation. This took away from the overall structure and flow. In future seminars, I will respond to this situation by stating that the topic will be covered later in the presentation and follow-up questions will be answered after that point.

4.2.3 TRAINING THREE

The third group to complete the training was also from Building Services and included fourteen participants (Figure 19). The training took place in the break room of the Health Services Center on March 12, 2015. There was no projector; therefore, I had packets of
the PowerPoint slides available, one for every two people. The unconventional training space was utilized because this group of employees did not have time in their schedules to travel to another room on campus. Building Services employees are spread out around campus and are rarely together in one place as a group, so I seized the opportunity after a training meeting to offer the seminar.

![Image](image154x473.png)

*Figure 19* Picture with two Building Services employees whom had just completed the training. Alex Growell (left), Dustin Dodd (middle), and myself (right).

In the second training I learned the importance of maintaining structure and following the sections I have created. In the third training this was a challenge again due to participants asking off-topic questions. Early in this training, one participant wanted to know if there were monetary or reward incentives for employee participation. The primary participation incentive to employees is the improvement in one’s daily work. There is a salary increase incentive to complete the Senior Lean Leader Certification, but that typically takes two years and is well outside the scope of being rewarded for everyday lean participation. While this set a challenging tone to the rest of the seminar, addressing employee rewards for participation could be a future consideration for Miami’s lean initiative.

4.2.4 PARTICIPANT FEEDBACK SURVEY

In order to analyze the effectiveness of my training, I developed a voluntary participant feedback form (Figure 20). I wanted feedback on two general topics: effectiveness of the training and the likelihood to participate in the lean program post training. The feedback survey responses helped to shape the current version of the Lean and Green presentation.

Of the 24 employees that participated in the training, 23 completed the feedback survey. Complete results can be found in Appendix V. Below is a summary of the results.

**Effectiveness of the training:**
• 70 percent of participants strongly agreed or agreed the training improved their understanding of Miami’s lean program

• 61 percent strongly agreed or agreed that TIMWOOD is a valuable component to the seminar

Likelihood to participate in the lean program:
• 57 percent strongly agreed or agreed that the seminar increased their interest in becoming a lean participant
• 52 percent are very likely or likely to submit a lean idea within a month

The main theme for “strengths of the seminar” was the amount of information in the given time. In fact, eight of the eleven participants that answered this question did so with phrases such as “lots of information” and “concise and informative.” Six participants responded to the “improvements to the seminar” question with six separate suggestions. Three particularly relevant suggestions that I have worked to address in the seminars included greater awareness of employees’ daily responsibilities, better management of participant questions, and that the seminar should go through the steps of submitting a lean idea.
4.3 DISCUSSION

As indicated by most seminar participants, the lean and green seminar has improved their understanding of PFD’s lean program. I am impressed that over half of the participants said they are likely or very likely to submit a lean idea after the seminar. During the third seminar, three employees expressed an interest in submitting lean ideas and joining lean
teams. I am hopeful that the seminar provides usable information and helps individuals participate in the lean program.

While, overall, the seminars went well, I found new ways in which to strengthen the presentation after each. One key lesson from the first three seminars is that more time is needed for the “Develop lean ideas” group activity and discussion. In each session, we were able to informally discuss lean ideas, but the planned small group activity and discussion was omitted in order to keep the seminar to one hour. The main reason for the lack of time was due to the group discussion during the slide that identifies the eight types of lean waste. In all three seminars the groups discussed various lean ideas during the TIMWOOD activity (slide 10). With each seminar group, the discussion consumed more time than originally allotted. In order to keep the lean waste discussion and provide more time for the “Develop lean ideas” activity, I eliminated three slides from the original version of 26 content slides. The slides I eliminated discussed the processes of selecting lean ideas and being on lean teams including the specific team member roles and steps of a lean project. This information is available in the 2-day training, should participants be interested to learn more. I removed this content because I think it is important to ensure that the small group activity occurs, since it provides an opportunity for participants to develop and discuss lean ideas.

Another improvement I made after the second seminar was to include the screenshot of the “I have a lean idea!” submission page (Figure 16, slide 19). Students do not have access to this page; therefore, it was difficult to explain to participants how to fill out the form without having a screenshot of it in the presentation. Having a screenshot of the form potentially reduces the sense of mystery around the lean idea submission process. Starting with the third seminar, participants have seen the exact form they will be asked to complete when submitting a lean idea and any doubt about the process has now been reduced or eliminated. One suggestion from the feedback survey is to complete the “I have a lean idea!” form as a group for one or two of the ideas we generate as a group. This is another potential improvement for the seminar. However, to do this thoroughly, the seminar will likely last 90 minutes instead of 60 minutes.

PFD will need to continue to offer this training until their goal of every PFD-employee receiving lean and green training is met. I will continue giving the presentation until I graduate in May and look forward to implementing the above changes.
CHAPTER 5. DISCUSSION AND RECOMMENDATIONS

When I first discussed the idea of taking on this practicum with my boss, and client, Yvette Kline, I was impressed that PFD was taking so seriously the importance of integrating environmental initiatives into their process efficiencies. At the onset, the practicum represented a variety of opportunities. I anticipated learning about lean methodologies and how environmental initiatives can support these processes, both economically and from an efficiency standpoint. I also anticipated gaining confidence in a public speaking role. I did not anticipate the many warm connections I would make with a wide variety of PFD employees nor the opportunities to swap stories of the inefficiencies and frustrations within our daily tasks. Sharing these experiences and stories with everyone has left me feeling bonded and invested with my new comrades.

The practicum also presented various challenges. The most challenging aspect of the practicum was controlling the flow of the seminar and managing audience feedback. While I am not sure I have mastered the art of audience control, I have learned some strategies for doing so such as redirecting questions and offering to speak one-on-one after the seminar. Another challenge was the inconsistent participation levels and training spaces. I originally hoped the average seminar size would include 20-25 participants. In reality, I had half or a small fraction of the ideal and not always in a proper training space. This negatively impacted the group activities and in the case of the makeshift training space, my ability to maintain audience control. In the latter circumstance, the lack of a proper presentation with PowerPoint slides decreased the level of focus in the room.

One large benefit of this practicum was my receptive and always available clients. Because we work in the same building, I often received answers to questions within hours, and often in a face-to-face impromptu meeting. I would like to thank my clients, Cody Powell, Yvette Kline, and Jeremy Davis, for being supportive and guiding me to a successful endpoint that brought a positive change to the department.

5.1 RECOMMENDATIONS

After reflecting on the entire practicum experience, including the interviews, surveys, and feedback from the seminar participants, I have developed a set of five recommendations for PFD that will help attract and retain employees in the lean program. These recommendations are for the various managers at PFD, both at the departmental level and those throughout the sub departments. Each of the recommendations was gleaned from interview or survey results, seminar experiences, research, or a combination of the four. A table summarizing the recommendations and their origins is available in Figure 21.
1. **Continue to offer seminar:** I recommend that PFD continue to offer the one-hour “Intro to Lean and Green at PFD” training seminar to employees without lean training, or that want to quickly catch up on the basics. The seminar should continue to be part of the normal paid workday. The PFD-wide survey found that the majority of respondents not involved with lean indicated an interest in attending a lean training (75%). Also, lack of training was a barrier to participating in lean that was identified by respondents (28%). The feedback from the seminar participants supported the improved understanding of lean and green initiatives of the majority of participants (70%). The seminar has been improved and can continue to be improved based on feedback. I also recommend that the presenter be familiar with the group to which they are presenting. The presenter should be prepared with examples of the lean wastes the target group contacts throughout their workday.

2. **Foster employee participation:** PFD presents lean as a tool to create change in one’s work processes; I recommend they support this idea by allowing employees newly trained in lean to get involved in lean teams and take part in the change process. This will help build confidence in employees that their thoughts and suggestions are valuable and that they are a necessary component at PFD. This recommendation is also supported by the interview and survey responses from lean trained employees. In both, employees gave advice such as “participate in the lean program” and “use lean to improve your job.” Additionally, three seminar participants expressed interest in getting on lean teams. This type of employee interest should be allowed to flourish through the opportunity to get more involved with the lean program.

3. **Build in time for lean projects:** PFD employees, both lean trained and untrained, perceive themselves as not having enough time to participate on lean teams. This claim is reflected in both the interview and lean survey results. From the interviews, everyone indicated time as a challenge to participation. From the surveys, 34% of respondents without lean training indicated they did not have enough time to participate in additional projects. I recommend that lean teams meet during the normal paid workday and that managers allow enough time for

---

**Figure 21** Table identifying the sources of inspiration for each of the five recommendations made to PFD regarding their Lean and Green program.

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Interview</th>
<th>Survey</th>
<th>Seminar</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continue to offer the seminar</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Foster employee participation</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Free up time for lean projects</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Showcase lean and green projects</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Establish participation incentives</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
employees to participate on the teams including completing homework items as well as attending meetings.

4. **Showcase lean and green projects:** Based on interactions with participants in the trainings, they are genuinely interested in the lean projects happening at PFD at any given time. I recommend that PFD showcase the current lean projects, including ones that fulfill the environmental objective, on the lean board in Cole Service Building and throughout the lean and green seminar. Examples of projects can include the transition to a paperless work order system and improvements in recycling infrastructure. This communication initiative could include information about the project’s purpose, team members with photos, deliverables, and start/end dates. This initiative will help familiarize employees with lean projects and PFD’s lean program. If employees are showcased along with the projects, the board will also serve as a social marketing tactic to increase participation in the program by spotlighting early adopters and portraying the behavior (lean participation) as normal (McKenzie-Mohr 2011). It could also impact employee perception of the degree of leanness and environmental friendliness achieved by the department. Based on the survey, 73% of respondents (20% of PFD employees) either strongly agree or agree that their daily work could be more efficient, while 49% of respondents (13% of PFD employees) either strongly agree or agree that their daily tasks could be more environmentally friendly. The above recommended communication initiative could improve these perceptions.

5. **Establish participation incentives:** Miami’s lean projects have resulted in millions of dollars in cost improvements (Krehbiel, Ryan and Miller 2015). I recommend PFD incentivize participation in the lean program. Incentives are a proven strategy to effectively change behavior (McKenzie-Mohr 2011). In a study by Condly, Clark, and Stolovitch, performance incentives were found to increase productivity by 22% (Condly, Clark and Stolovitch 2003). Seminar participants also discussed the use of incentives as a good way to increase interest and participation in PFD’s lean program. Incentives can be as small as a monthly raffle for lean participants or as large as a vacation raffled off once per year. At a previous job, my employer incentivized hard work and dedication to the company by awarding a week-long vacation to Hawaii for two to a deserving employee. I can honestly say this increased employee morale and effort in providing excellent customer service throughout the year. Other incentive ideas include recognition of good work in a monthly newsletter or on the employee awards board at PFD or recognizing an “employee of the month.”
CHAPTER 6. REFLECTION

I have grown tremendously since my introduction to the Institute for the Environment and Sustainability (IES) program. I am a better writer, team member, researcher, and participant. I have gained skills such as community outreach, statistical analysis, program development for behavior change, and public speaking. Some of these advances were fostered in a classroom while others were gained through applied experience, both of which IES offers in spades.

The Professional Service Project (PSP) component to IES combines both experience and research-based learning. My PSP team worked on developing an outreach and marketing plan for Ohio EPA. The plan guides solid waste management districts through the process of developing, measuring, and maintaining effective outreach and community engagement in solid waste management programs such as recycling. Work on the PSP lasted a full academic year and was done with a team of five students, all new to the IES program. Succeeding on the team required cooperation, communication, and patience, among other virtues. While succeeding on the team was a personal challenge, I rose to it; I learned a lot about myself, about my weaknesses and my strengths as a student and an individual.

During my second year in the program, I accepted an internship at PFD working for Yvette Kline, the Director of Sustainability and Energy Conservation. It was through my internship that I was offered to complete the practicum and help bring a new lean training option to the department. The practicum interested me because I wanted public speaking experience and I love working one-on-one with people. I knew this practicum would involve both and it did. The experience of developing and providing employee enrichment through flexible training options supports my overall career objectives of becoming employed in a community outreach and communication position. I look forward to applying to become a Grameen Foundation Fellow upon graduation from IES. If accepted, I would work internationally and help develop and maintain programs that fight global poverty.
APPENDICES

Appendix I: Lean Survey Questionnaire

Research and Survey Consent Information

In 2011, Miami University adopted a Lean initiative that seeks to reduce costs, maximize efficiencies, and improve its environmental footprint. While the Lean program at Miami is young, it is gaining momentum among employees and is already saving the university millions of dollars each year.

The purpose of this research is to gather information about employee involvement in Lean and sustainability initiatives within Miami University’s Department of Physical Facilities. This research is being conducted as part of a graduate degree project by Anna Ginsky under the guidance of Dr. Sarah Dumyahn, who are both affiliated with the Institute for the Environment and Sustainability at Miami University. Invitations to complete this online survey have been sent to all Miami University Physical Facilities Department employees. You must be at least 18 years old to participate in this survey.

Completing this survey should take around 10 minutes or less. Participation in this survey is completely voluntary. You can skip questions that you do not want to answer and can stop taking the survey at any time. This survey is anonymous and does not contain questions that could reveal your identity. Only Anna Ginsky and Dr. Sarah Dumyahn will have access to the responses. Individual responses will be kept private. Information from this survey will be presented as aggregate summaries on the community boards at Physical Facilities to raise awareness about Lean and sustainability initiatives. The anonymous and aggregated responses will also be used in preparation of an “Introduction to Lean” training seminar.

If you have questions about this research or you feel you need more information before completing this survey, you can contact Anna Ginsky at ginskyal@miamioh.edu or Dr. Sarah Dumyahn at harveysl@miamioh.edu. If you have questions about the rights of research subjects, you may contact the Office for the Advancement of Research and Scholarship at (513) 529-3600 or email responsibleresearch@miamioh.edu.

Thank you in advance for your participation!

~ Anna Ginsky

1. Have you heard about the Lean program at Miami University?
   o Yes
   o No

2. Are you involved in Lean at Physical Facilities?
   o Yes
   o No
* Here there was a branch- “Yes” responses skipped ahead to answer questions 10-20, “No” responses answered questions 3-9.

3. Indicate your level of agreement with the following two statements:

I think some of the processes in my job could be more efficient.
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree
- Not sure

I think some of the processes in my job could be more environmentally friendly.
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree
- Not sure

4. What degree of “environmental friendliness” has Physical Facilities achieved?
- Very environmentally friendly
- Environmentally Friendly
- Progressing toward
- Not moving rapidly enough
- Not at all environmentally friendly
- Not sure

5. What degree of “Leaness” has Physical Facilities achieved?
- Very lean
- Lean
- Progressing toward
- Not moving rapidly enough
- Not at all lean
- Not sure

6. What challenges exist that keep you from getting involved in Lean projects? Select all that apply.
- Awareness of the Lean program
- Knowledge about how to participate
- Lack of Lean training options
- No time to participate in additional projects
- No challenges exist
- Other
7. Would you be interested in attending a one-time 60-minute “Introduction to Lean” training, as part of your normal paid workday?
   - Yes
   - No

8. How many years have you been employed at Miami University?

9. How many years have you been employed at Physical Facilities?

10. What types of Lean involvement have you had? Select all that apply.

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Yes: 1-2</th>
<th>Yes: 3-4</th>
<th>Yes: 5+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submitted a Lean idea?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, about how many?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Been on a Lean team?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, about how many?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Led a Lean team?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, about how many?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11. Has your Lean involvement included projects with a “green” or environmentally friendly component? If yes, select about how many.
   - No
   - Yes: 1-2
   - Yes: 3-4
   - Yes: 5+

12. Have you been through a Lean training? Select all that apply.
   - 1.5 Lean Overview
   - Lean Orientation 3 Hours
   - Lean 2-Day Training
   - Lean Visio for Lean Projects
   - Lean Overview Train the Trainer
   - Senior Lean Leader Trainer
   - No
   - Other

13. What have been your achievements or successes during your Lean journey? Select all that apply.
Gained knowledge
Improved the sustainability of my daily work
Improved the sustainability of Miami University
Gained confidence in a leadership role
Developed new connections with other coworkers
Other

14. Have you had any challenges participating in Lean projects? Select all that apply.
- Poor leadership
- Poor organization of team
- Poor organization of work
- Conflicting viewpoints
- Inability of team to meet deadlines
- No
- Other

15. What would be helpful advice for employees that are interested in becoming Lean participants?

16. Indicate your level of agreement with the following two statements:

I think some of the processes in my job could be more efficient.
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree
- Not sure

I think some of the processes in my job could be more environmentally friendly.
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree
- Not sure

17. What degree of “environmental friendliness” has Physical Facilities achieved?
- Very environmentally friendly
- Environmentally Friendly
18. What degree of “Leanness” has Physical Facilities achieved?
   - Very lean
   - Lean
   - Progressing toward
   - Not moving rapidly enough
   - Not at all lean
   - Not sure

19. How many years have you been employed at Miami University?

20. How many years have you been employed at Physical Facilities?
Appendix II: Survey Invitation Emails to PFD Employees

Email 1: Sent on December 18, 2014 to all PFD employees

Hello fellow PFD employees,

As a graduate student researcher at Miami and the Sustainability Education Coordinator in PFD, I'm interested in gathering information about PFD's Lean program. Whether you are familiar with Lean initiatives or not or have been through training or not, I would greatly appreciate your input. The survey should take about five minutes to complete and is voluntary.

Click on the following link to access the survey or copy/paste the URL into your browser:
https://miamioh.qualtrics.com/SE/?SID=SV_8jucEGDMW26XeqJ

"[Lean] gives employees an opportunity to be involved in positive change that has an impact on their daily lives. Often times we find that a Lean idea results in making someone's job easier or more enjoyable; almost all quality improvements come from simplifying a process."
- Jeremy Davis, Senior Lean Leader, Physical Facilities

Please contact me at ginskyal@miamioh.edu with any questions.
Thank you for your time and help,

Anna Ginsky

Email 2: Sent on January 7, 2015 to all PFD employees

Hello again, fellow PFD employees,

Before winter break, I sent out an email asking you to participate in a short survey regarding PFD's Lean program. If you haven't had a chance to take the survey, perhaps this week, when you're stuck inside trying to stay warm, you could spare 5 minutes to do so!

Click on the following link to access the survey or copy/paste the URL into your browser:
https://miamioh.qualtrics.com/SE/?SID=SV_8jucEGDMW26XeqJ

You need not have Lean experience to complete the survey. I'm looking for responses that reflect a variety of Lean involvement. And again, the survey will greatly help with my graduate research project regarding the development of Lean and Green initiatives at PFD.

Your participation is greatly appreciated.

Anna Ginsky

Email 3: Sent on January 29, 2015 to all PFD employees

Hi everyone,

First off, a warm thanks to the many of you who have participated in my "Lean and Green" survey. Your time is very much appreciated.

Aside from gaining my appreciation, participating in the survey strengthens the accuracy of the survey results and my graduate student project on which my graduation depends.

For these reasons, I am asking one last time for anyone who has not participated to please spare 5 minutes to do so! "No Lean experience required!"

Click on the following link to access the survey or copy/paste the URL into your browser:
https://miamioh.qualtrics.com/SE/?SID=SV_8jucEGDMW26XeqJ

Please contact me with any questions regarding this survey.

Best,

Anna Ginsky
Appendix III: Lean Survey Results

Of the 336 employees that received an invitation to participate in the lean survey, 94 employees participated. Below are the results of the survey.

Question 1: Have you heard about the Lean program at Miami University?

<table>
<thead>
<tr>
<th>Number of responses</th>
<th>Percentage of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>94</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
</tbody>
</table>

Question 2: Are you involved in Lean at Physical Facilities?

<table>
<thead>
<tr>
<th>Number of responses</th>
<th>Percentage of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>61</td>
</tr>
<tr>
<td>No</td>
<td>33</td>
</tr>
</tbody>
</table>

Based on information provided by the client, 94 of the 336 PFD employees had been through a lean training at the time of the survey. However, the question was eliciting responses to being involved, not trained. As is noted below (Direction 2, Question 5), 18 of the respondents who indicated they are involved in the lean program at PFD have no formal lean training. Therefore, of the survey responses, 43 respondents had been through a lean training at the time of the survey, while 51 had not.

*Here there was a branch in the survey. Respondents that indicated they were not involved in lean went one direction (Direction 1) while those that indicated they were involved went in another (Direction 2).

Direction 1: “No” Lean Involvement

Question 3: I think some of the processes in my job could be more efficient.

<table>
<thead>
<tr>
<th>Number of responses</th>
<th>Percentage of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>8</td>
</tr>
<tr>
<td>Agree</td>
<td>15</td>
</tr>
<tr>
<td>Neither agree nor disagree</td>
<td>5</td>
</tr>
<tr>
<td>Disagree</td>
<td>1</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>0</td>
</tr>
<tr>
<td>Not sure</td>
<td>4</td>
</tr>
</tbody>
</table>

Question 4: I think my daily tasks could be more environmentally friendly.

<table>
<thead>
<tr>
<th>Number of responses</th>
<th>Percentage of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>4</td>
</tr>
<tr>
<td>Agree</td>
<td>10</td>
</tr>
<tr>
<td>Neither agree nor disagree</td>
<td>11</td>
</tr>
</tbody>
</table>
Question 5: What degree of “environmental friendliness” has Physical Facilities achieved?

<table>
<thead>
<tr>
<th>Degree</th>
<th>Number of responses</th>
<th>Percentage of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very environmentally friendly</td>
<td>3</td>
<td>10%</td>
</tr>
<tr>
<td>Environmentally friendly</td>
<td>7</td>
<td>23%</td>
</tr>
<tr>
<td>Progressing toward</td>
<td>7</td>
<td>23%</td>
</tr>
<tr>
<td>Not moving rapidly enough</td>
<td>3</td>
<td>10%</td>
</tr>
<tr>
<td>Not at all environmentally friendly</td>
<td>3</td>
<td>10%</td>
</tr>
<tr>
<td>Not sure</td>
<td>8</td>
<td>26%</td>
</tr>
</tbody>
</table>

Question 6: What degree of “Leanness” has Physical Facilities achieved?

<table>
<thead>
<tr>
<th>Degree</th>
<th>Number of responses</th>
<th>Percentage of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very lean</td>
<td>3</td>
<td>10%</td>
</tr>
<tr>
<td>Lean</td>
<td>7</td>
<td>23%</td>
</tr>
<tr>
<td>Progressing toward</td>
<td>7</td>
<td>23%</td>
</tr>
<tr>
<td>Not moving rapidly enough</td>
<td>4</td>
<td>13%</td>
</tr>
<tr>
<td>Not at all lean</td>
<td>3</td>
<td>10%</td>
</tr>
<tr>
<td>Not sure</td>
<td>7</td>
<td>23%</td>
</tr>
</tbody>
</table>

Question 7: What challenges exist that keep you from getting involved in Lean projects? Select all that apply.

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Number of responses</th>
<th>Percentage of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness of the lean program</td>
<td>3</td>
<td>9%</td>
</tr>
<tr>
<td>Knowledge about how to participate</td>
<td>6</td>
<td>19%</td>
</tr>
<tr>
<td>Lack of lean training options</td>
<td>9</td>
<td>28%</td>
</tr>
<tr>
<td>No time to participate in additional projects</td>
<td>11</td>
<td>34%</td>
</tr>
<tr>
<td>No challenges exist</td>
<td>6</td>
<td>19%</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>28%</td>
</tr>
</tbody>
</table>

It appears that over half of the respondents would participate in the lean program if they had a clear understanding of how to do so.

Question 8: Would you be interested in attending a one-time 60-minute “Introduction to Lean” training, as part of your normal paid workday?

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of responses</th>
<th>Percentage of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>24</td>
<td>75%</td>
</tr>
</tbody>
</table>
Question 9: How many years have you been employed at Miami University?

<table>
<thead>
<tr>
<th>Maximum</th>
<th>27 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>.5 years</td>
</tr>
<tr>
<td>Mean</td>
<td>9.4 years</td>
</tr>
<tr>
<td>Median</td>
<td>9 years</td>
</tr>
</tbody>
</table>

Question 10: How many years have you been employed at Physical Facilities?

<table>
<thead>
<tr>
<th>Maximum</th>
<th>27 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>.5 years</td>
</tr>
<tr>
<td>Mean</td>
<td>8.5 years</td>
</tr>
<tr>
<td>Median</td>
<td>8 years</td>
</tr>
</tbody>
</table>

I thought there might be a correlation between years worked at PFD and willingness to participate in the “Intro to Lean and Green” seminar. Specifically, I thought people who became employed at PFD after the economic crisis (and layoffs) of 2008 would be more willing to get involved in the program. I ran a chi-square test on years worked at PFD and responses to Question 8. With a chi-square value of 0.41, I concluded these two variables are independent of each other.

Direction 2: “Yes” Lean Involvement

Question 3: What types of Lean involvement have you had? Select all that apply.

<table>
<thead>
<tr>
<th>Submitted a Lean idea? If so, how many?</th>
<th>No</th>
<th>Yes: 1-2</th>
<th>Yes: 3-4</th>
<th>Yes: 5+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>10</td>
<td>19</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>Been on a Lean team? If so, how many?</td>
<td>17</td>
<td>28</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Led a Lean team? If so, how many?</td>
<td>41</td>
<td>7</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

Question 4: Has your Lean involvement included projects with a “green” or environmentally friendly component? If yes, select about how many.

<table>
<thead>
<tr>
<th>Number of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>Yes: 1-2</td>
</tr>
<tr>
<td>Yes: 3-4</td>
</tr>
<tr>
<td>Yes: 5+</td>
</tr>
</tbody>
</table>

Question 5: Have you been through a Lean training? Select all that apply.

<table>
<thead>
<tr>
<th>Number of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 Lean Overview</td>
</tr>
<tr>
<td>Lean Orientation 3 Hours</td>
</tr>
</tbody>
</table>
Lean 2-Day Training | 30
Lean Visio for Lean Projects | 4
Lean Overview Train the Trainer | 1
Senior Lean Leader Training | 6
No | 18
Other | 6

Respondents who selected “other” all indicated training associated with the Senior Lean Leader Certification.

Question 6: What have been your achievements or successes during your Lean journey? Select all that apply.

<table>
<thead>
<tr>
<th>Achievements</th>
<th>Number of responses</th>
<th>Percentage of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gained knowledge</td>
<td>48</td>
<td>81%</td>
</tr>
<tr>
<td>Improved the sustainability of my daily work</td>
<td>24</td>
<td>41%</td>
</tr>
<tr>
<td>Improved the sustainability of Miami University</td>
<td>35</td>
<td>59%</td>
</tr>
<tr>
<td>Gained confidence in a leadership role</td>
<td>19</td>
<td>32%</td>
</tr>
<tr>
<td>Developed new connections with other coworkers</td>
<td>30</td>
<td>51%</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>10%</td>
</tr>
</tbody>
</table>

“Other” responses can be grouped into the following three categories: reduced overall costs, improved departmental efficiency, learned new problem-solving methodologies. Examples of these categories include “reduced costs,” “better application of resources,” and “learned methodologies to solve problems.”

Question 7: Have you had any challenges participating in Lean projects? Select all that apply.

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Number of responses</th>
<th>Percentage of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor leadership</td>
<td>7</td>
<td>13%</td>
</tr>
<tr>
<td>Poor organization of team</td>
<td>8</td>
<td>15%</td>
</tr>
<tr>
<td>Poor organization of work</td>
<td>5</td>
<td>9%</td>
</tr>
<tr>
<td>Conflicting viewpoints</td>
<td>11</td>
<td>20%</td>
</tr>
<tr>
<td>Inability of team to meet deadlines</td>
<td>5</td>
<td>9%</td>
</tr>
<tr>
<td>No</td>
<td>29</td>
<td>53%</td>
</tr>
<tr>
<td>Other</td>
<td>13</td>
<td>24%</td>
</tr>
</tbody>
</table>

“Other” responses included the following themes: lack of time (indicated by five respondents), poorly defined projects (indicated by two respondents), unsuitable team
members (indicated by two respondents), and lack of management follow-up on submitted lean ideas (indicated by one person).

Question 8: What would be helpful advice for employees that are interested in becoming Lean participants?

This question was open ended and received 15 text responses and 1 blank response.

Two themes emerged that are intended for PFD management as opposed to non-lean participating employees. Three employees indicated they would like a centralized information access point that shows the lean ideas that have been submitted and the lean projects that are currently underway. There should also be a way for employees to express interest in being on a team for a specific lean idea in this access point. Disappointment was expressed in not being on the lean team for your own lean idea. This sentiment was also expressed in interviews. One employee expressed the importance of management providing support for team members that want to get involved with the lean program.

Other themes included “use lean to improve your job” (4 respondents), “actively engage when on a lean team” (5 respondents), “get involved with environmental lean projects” (1 respondent), and “pursue lean training such as the 2-day lean training” (1 respondent).

Question 9: I think some of the processes in my job could be more efficient.

<table>
<thead>
<tr>
<th></th>
<th>Number of responses</th>
<th>Percentage of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>16</td>
<td>27%</td>
</tr>
<tr>
<td>Agree</td>
<td>29</td>
<td>48%</td>
</tr>
<tr>
<td>Neither agree nor disagree</td>
<td>9</td>
<td>15%</td>
</tr>
<tr>
<td>Disagree</td>
<td>4</td>
<td>7%</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td>Not sure</td>
<td>1</td>
<td>2%</td>
</tr>
</tbody>
</table>

Question 10: I think my daily tasks could be more environmentally friendly.

<table>
<thead>
<tr>
<th></th>
<th>Number of responses</th>
<th>Percentage of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>7</td>
<td>12%</td>
</tr>
<tr>
<td>Agree</td>
<td>24</td>
<td>40%</td>
</tr>
<tr>
<td>Neither agree nor disagree</td>
<td>19</td>
<td>32%</td>
</tr>
<tr>
<td>Disagree</td>
<td>4</td>
<td>7%</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>3</td>
<td>5%</td>
</tr>
<tr>
<td>Not sure</td>
<td>3</td>
<td>5%</td>
</tr>
</tbody>
</table>

Question 11: What degree of “environmental friendliness” has Physical Facilities achieved?

<table>
<thead>
<tr>
<th></th>
<th>Number of responses</th>
<th>Percentage of responses</th>
</tr>
</thead>
</table>
Very environmentally friendly | 5 | 8%
Environmentally friendly | 19 | 32%
Progressing toward | 26 | 43%
Not moving rapidly enough | 7 | 12%
Not at all environmentally friendly | 0 | 0%
Not sure | 3 | 5%

Question 12: What degree of “Leanness” has Physical Facilities achieved?

<table>
<thead>
<tr>
<th></th>
<th>Number of responses</th>
<th>Percentage of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very lean</td>
<td>10</td>
<td>17%</td>
</tr>
<tr>
<td>Lean</td>
<td>18</td>
<td>30%</td>
</tr>
<tr>
<td>Progressing toward</td>
<td>23</td>
<td>38%</td>
</tr>
<tr>
<td>Not moving rapidly enough</td>
<td>4</td>
<td>7%</td>
</tr>
<tr>
<td>Not at all lean</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td>Not sure</td>
<td>4</td>
<td>7%</td>
</tr>
</tbody>
</table>

Question 13: How many years have you been employed at Miami University?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>28 years</td>
</tr>
<tr>
<td>Minimum</td>
<td>.5 years</td>
</tr>
<tr>
<td>Mean</td>
<td>10.3 years</td>
</tr>
<tr>
<td>Median</td>
<td>8 years</td>
</tr>
</tbody>
</table>

Question 14: How many years have you been employed at Physical Facilities?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>28 years</td>
</tr>
<tr>
<td>Minimum</td>
<td>.5 years</td>
</tr>
<tr>
<td>Mean</td>
<td>9.2 years</td>
</tr>
<tr>
<td>Median</td>
<td>8 years</td>
</tr>
</tbody>
</table>
Appendix IV: “Intro to Lean and Green” PowerPoint Slides and Notes

Slide 1

Lean at Physical Facilities

An introduction to Lean with information on how to get involved and go green!

Miam i Un iversity

Slide 2

Miami’s #1 goal

To provide the best undergraduate student experience in the country.

Everything needs to be driving this goal- this mission. This is why we’re here and this is what keeps us in business.

One way we can ensure we stand out from other schools is to keep improving; to identify the areas that can be improved and do it! This is the core concept of Lean- continuous improvement.
Miami aims to have 100% of its employees exposed to Lean training by 2020.

2020 Plan:
“Promote a work environment built upon continuous improvement and evaluation that empowers employees through ongoing professional development and career growth opportunities.”

Miami has a lean participation goal; however, management at PFD is also very supportive of employees becoming involved in lean. There are constantly lean projects underway at PFD. After having spoken to many of the lean leaders, it’s clear that gaining more employee interest is a priority!

Why? Lean is about continuous improvement. We need to be continuously improving to be able to provide THE BEST student experience.

In a recent survey of all PFD employees- 70% of people said their daily work could be more efficient and 45% said it could be more environmentally friendly.

This implies that there is room for improvement in our department- here at Physical Facilities!

Slide 4

Overview

- History of Lean
- Lean vocabulary
- “Breakthrough” objectives
- Break out session
- I have a Lean idea!
- Lean training
- Lean advice
LEAN came to Miami University in 2009, as a result of the economic crisis. Because of the economic crisis, the school lost a lot of state funding. So they had to figure out how to maintain the goal despite the reduced funding- in comes LEAN. Lean is a framework for continuous improvement and the elimination of waste. And to quote Al Ryan (the director of Lean Initiatives at Miami) “it’s not that people are wasteful, but the things we ask people to do are!”

So lean came to Miami in 2009, it started in HDRBS, and came to Physical Facilities in around 2011.

In just 6 years Miami has trained over 1600 employees in lean, over 600 employees actively submit lean ideas each month, and hundreds of lean projects resulting in millions of dollars in cost savings and avoidance! At PFD, nearly 4 million has been generated in cost avoidance, cost savings, and increased revenue- we’re doing a great job- we have submitted over 300 lean ideas with over 100 of those that turned into lean projects. We’re doing a great job, but we could be doing better!

And, with 1600+ employees already trained in lean principles, Miami is on it’s way to the 2020 objective, but it’s not there yet!

Slide 6

Who else is Lean?

- Bowling Green State University
- University of Michigan
- Notre Dame
- University of Iowa
- University of New Orleans
- University of Scranton
- University of Central Oklahoma
  (To name a few...)
So, we are among many universities that have adopted lean as a process optimization technique! We are also a leader in this field. Other schools reach out to us, asking about our lean framework and techniques to our success.

**Slide 7**

<table>
<thead>
<tr>
<th>Use Lean to control your work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lean gives you a unique opportunity to</td>
</tr>
<tr>
<td>✓ Influence your daily tasks</td>
</tr>
<tr>
<td>✓ Improve the efficiency of your daily tasks</td>
</tr>
<tr>
<td>✓ Improve the environmental friendliness of your daily tasks</td>
</tr>
<tr>
<td>✓ Help create improvements within PFD</td>
</tr>
</tbody>
</table>

So, it’s clear that lean is good for the university. But, it’s also a tool to help employees in their daily work!

Lean is a tool that allows employees to control their work and changes in their work.

I know in my job- I have a few tasks where I find myself saying- “Why do we do this *this* way- this job could get done A LOT faster if it was done *that* way- or if *these* changes were made.” In instances like these- lean is a tool that employees can use to make those changes.

Lean is also a framework where employees can be part of the change- it’s your opportunity to offer your expertise and experiences during the change process where the best solution is determined.

Lean is also an opportunity to reverse “top-down” styles of management. In lean teams, there’s no “top-down”- it’s all about the group and creating answers to questions as a team.

This are just a few examples of how lean allows employees to have more control over the work they do every day.

And then you have the opportunity to create improvements within PFD in general if you are on a lean team that doesn’t necessarily impact your work- but other work within the department (Fresh eyes).
Other outcomes of Lean participation

In a recent survey of PFD employees...
Employees said that by participating in PFDs Lean program they
- Gained knowledge- 81%
- Improved the sustainability of Miami- 59%
- Developed new connections with other coworkers- 51%
- Improved the sustainability of their daily work- 41%
- Gained confidence in a leadership role- 32%

So, you can use lean to control your work. But, employees have found that participating in lean also has personal benefits. In the recent PFD survey, employees with lean experience reported the following benefits. I can also vouch for some of these. I went through the Lean 2-day training and interacted with three people from PFD, two project managers and a landscape architect. I would have never really crossed paths with these people and now we’re good acquaintances. So, you definitely will get to know people with whom you may not have had the opportunity!

Miami’s Lean Framework
Miami Lean: The relentless pursuit to eliminate waste; continuous improvement.

Waste: Any business activity that does not add value to the customer, which includes:

- **Transport:** Unnecessary movement of resources from one service activity or location to another.
- **Inventory:** Any excess inventory that is not directly required for delivery of offerings and services.
- **Motion:** Extra steps taken by employees to accommodate inefficient process layouts, defects, re-processing, over-servicing, and too little/much inventory.
- **Waiting:** Time spent waiting for a critical activity to occur.
- **Overproduction/Over-servicing:** Unneeded offerings or services.
- **Over processing:** Extra operations due to defects, over-servicing, etc.
- **Defects:** Aspects of our service that do not conform to customer expectation or internal requirements, thus causing dissatisfaction.

TIMWOOD

~For each of the examples of “waste”, encourage people to offer examples of waste they have seen in their jobs~

**Transport** - resources refers to people, tools, equipment, materials, documents, etc.
**Inventory** - “inventory” consists of supply resources such as excess materials, equipment, and facilities
**Waiting** - slows up whole process and can create extra costs and customer dissatisfaction
**Overproduction/over-servicing** - Offerings or services are performed which are not needed, *possibly the worst type of waste for a Lean organization. Over-servicing can lead to the customer being overcharged for the benefit they receive, internal resources being tied up with less productive activities, and increased internal costs with no benefits.
**Over processing** - Extra operations include unnecessary levels of decision making, rework, re-processing, handling, and storage.

Use the acronym TIMWOOD to help remember the different types of waste!

Technically speaking, there is one more type of waste: lack of creativity/buy-in from employees. This is actually a critical component to the success of lean in a business. Lean needs employee buy-in to function. Employees are the experts at what they do and they know when something isn’t working as efficiently as it could. Lean cannot thrive without these valuable insights into the process.
Steps of a process fall into one of two categories: value added and non-value added.

Non-value added steps are often where we find lean opportunities, or areas for improvement.

The current and future states are things that the lean team will discuss and map out. Mapping out and understanding the “current state” is a critical step in the lean process. You can’t move on to developing the “future state” until all aspects of the current state have been identified and discussed.

These are the 5 objectives of ALL lean ideas and projects. Every lean idea should fulfill at least one of these objectives.

While it’s clear that saving money and increasing productivity are priorities for a business, “going green” is also becoming a priority. And in many instances, going green can save the university money. I will show some of these examples in the next few slides.
Projects that increase revenue literally make money for the university.

Doug Hammerle, Director of Energy Systems, brought forward the Lean idea for Miami to participate in Duke’s “Demand Response Program” where Duke offers financial incentives for a business to reduce its peak energy usage. Participating in this program helps the business understand when and how they can reduce their energy usage while saving and making money.

This lean idea literally made the school money.

Auto scrubbers- faster, cleaner, and safer
• Can clean 3x the area in the same amount of time as by hand
• Hand cleaning can leave dirt on the floor whereas auto scrubbers vacuum up waste product
• Auto scrubbers leave floors drier than conventional floor care methods
• This project increased employee productivity and ultimately avoids costs over the life of the auto scrubber. The project was expanded to Hughes Hall and Benton-Engineering Building.
Cost reduction projects reduce the costs of doing a project; so it’s something we have done in the past, and now this new way of doing it, or “future state”, will reduce the amount of resources required to get the job done.

Example: we used to spend $300 to get the job done, now we only spend $250 = cost reduction. And this is different from cost avoidance…

Cost avoidance projects reduce the work so employees can spend time on other more “value added” tasks. We have removed waste and other non-value activities, but not the direct resource.

VAV- Variable Air Volume- controls the amount of conditioned air that goes to areas in a building
Slide 17

The Project Identification matrix helps you identify the overall value and level of difficulty of the project. The y-axis is where you will determine the overall potential savings, or value, of the lean idea. The x-axis is where you will determine the difficulty of completing the lean project. Thinking in terms of the project identification matrix will help you analyze the overall feasibility of doing a project. If it has low savings and high difficulty it might not be the best project or might be able to be broken down into smaller projects.

Remember that all projects must satisfy at least one of the break through objectives.

Once you have agreed on 4 potential Lean ideas, at least one should fulfill the “green initiatives” objective, place them into the Project ID matrix and elect a spokesperson to describe the ideas to the group.

*Will give the room about 5 minutes to complete the activity- then will go around to each group and have the spokesperson describe one of their ideas and their green idea.*

Slide 18

First off, submitting lean ideas doesn’t mean you have to be on the lean team if your idea is accepted as a project.
~Now walk through the process of getting to the “I have a lean idea!” page~

You can also access it from a simple “Lean” search on Miami’s website. Simply type in Lean, select Lean Initiatives and scroll down to “I have a Lean idea!”

Slide 19

This is the screen you will see when you select “I have a lean idea” from MyCard.

~If time allows, have the group complete the fields for one of the lean ideas mentioned in the group activity. If time doesn’t allow, describe the various fields~

Slide 20

Go Lean!
Get Lean trained!

2-day Lean Training
• Understand project steps
• Learn the tools to analyze projects
• Walk through the steps of a Lean project that your small group creates

In the 2-day LEAN training you will:

• Get a better understanding of project steps
• Learn specific tools to help analyze processes
• Go through a complete project - from defining the current state to mapping out the future state and discussing standard work

You get a lot of hands on experience. Constantly working in groups and figuring things out together as a team.

Not all lecture- mostly team work. Very interesting and the two days will fly by!

So, if you liked learning about lean and you want to learn more and get involved you can start getting involved right away by submitting ideas and if you want to get on a Lean team ask your supervisor! Also, inquire with your supervisor about getting into one of the 2-day training seminars!

Slide 22

Words of advice...

Interviewer: Al, what advice would you give to employees that have no Lean experience?

Al Ryan: "WE WANT 'EM!"

"Lean is about eliminating waste - and this isn't to say that people are wasteful - but the things we ask them to do are." – Al Ryan

"Participating on a Lean team is a great way to see the process and value of a Lean idea and it's implementation."

"Take the 2-day class to see the potential impact you can have."

"Try to do projects that save the environment."

"Don't be scared to submit a lean idea on a job you do."
Slide 23

How you can help today...

• If you see a recurring issue…
• If you know a better way to perform a task…
• If you find something that works better for you and could do the same for others…

...share your ideas with your manager or submit a Lean idea!

Slide 24

Questions

Slide 25

Thank you for coming!
Before leaving please consider taking the closing survey to provide feedback on this Lean training.
Appendix V: “Intro to Lean and Green” Participant Feedback Form and Results

Part A. Participant Feedback Form

This Feedback Form is intended to provide insight as to the effectiveness of the Intro to Lean Seminar. Participation in this survey is voluntary, anonymous and should take around 5 minutes. You must be at least 18 years old to participate in this survey. Please direct questions about this survey and the seminar to Anna Ginsky (ginskyal@miamioh.edu) or Dr. Sarah Dunnyah (harveys@miamioh.edu). For questions regarding your rights as a research participant, please contact the Research Compliance Office at (513) 529-3600 or havansubjects@miamioh.edu.

Intro to Lean Seminar Feedback Form

Please indicate your level of agreement with the following statements. Circle your response.

Q 1. This seminar improved my understanding of Miami’s Lean program.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

Q 2. This seminar increased my interest in being a Lean participant.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

Q 3. How likely are you to submit a Lean idea in the next month?
   - Very Likely
   - Likely
   - Don’t Know
   - Unlikely
   - Very Unlikely

Q 4. Learning the types of waste (TIMWOOD) is a valuable component of this seminar.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

Q 5. The “Develop Lean ideas” group activity is a valuable component of this seminar.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

What were the strengths of this seminar?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

How can this seminar be improved?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Please provide any additional comments you have regarding the Intro to Lean seminar on the back of this form.

Thank you for your time!
Part B. Participant Feedback Form Results

The following three questions were intended to gauge overall effectiveness of the seminar.

Question 1: This seminar improved my understanding of Miami’s lean program.

The large majority of participants felt the seminar increased their understanding of Miami’s lean program. However, more than a quarter of respondents indicated a neutral response to the claim. This implies there is room for improvement with the seminar.

<table>
<thead>
<tr>
<th></th>
<th>Number of responses</th>
<th>Percentage of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>7</td>
<td>31%</td>
</tr>
<tr>
<td>Agree</td>
<td>9</td>
<td>39%</td>
</tr>
<tr>
<td>Neutral</td>
<td>6</td>
<td>26%</td>
</tr>
<tr>
<td>Disagree</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

This seminar improved my understanding of Miami’s lean program.

Question 2: This seminar increased my interest in being a lean participant.

Respondents were predominantly positive as to whether the seminar convinced them to become lean participants. There were five neutral and five negative responses, which again, insinuates there is room for improvement in the seminar. Ultimately, the seminar should increase confidence in the program and interest in participation.

<table>
<thead>
<tr>
<th></th>
<th>Number of responses</th>
<th>Percentage of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>6</td>
<td>26%</td>
</tr>
<tr>
<td>Agree</td>
<td>7</td>
<td>31%</td>
</tr>
<tr>
<td>Neutral</td>
<td>5</td>
<td>22%</td>
</tr>
<tr>
<td>Disagree</td>
<td>4</td>
<td>17%</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>1</td>
<td>4%</td>
</tr>
</tbody>
</table>
Question 3: How likely are you to submit a lean idea in the next month?

Responses to this statement were mixed. Around half the respondents are more interested in the lean program and participation as a result of the seminar. However, around 20 percent are not interested in the program and likely will not participate. These results stand to be improved with a stronger seminar.

<table>
<thead>
<tr>
<th>Number of responses</th>
<th>Percentage of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very likely</td>
<td>3</td>
</tr>
<tr>
<td>Likely</td>
<td>9</td>
</tr>
<tr>
<td>Neutral</td>
<td>6</td>
</tr>
<tr>
<td>Unlikely</td>
<td>4</td>
</tr>
<tr>
<td>Very Unlikely</td>
<td>1</td>
</tr>
</tbody>
</table>

The following two questions were intended to gauge the effectiveness of the two group activities within the seminar.
Question 4: Learning the types of waste (TIMWOOD) is a valuable component of this seminar.

The majority of participants either agreed or were neutral that the first group activity was a worthwhile component to the seminar. Only 13 percent disagreed with the claim. While 13 percent is a low number, I think this activity can be improved by establishing more control over the trajectory of the group discussion. The presenter should keep participants focused and be ready with relevant examples for each type of waste.

<table>
<thead>
<tr>
<th>Number of responses</th>
<th>Percentage of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>5</td>
</tr>
<tr>
<td>Agree</td>
<td>9</td>
</tr>
<tr>
<td>Neutral</td>
<td>6</td>
</tr>
<tr>
<td>Disagree</td>
<td>3</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>0</td>
</tr>
</tbody>
</table>

Question 5: The “Develop lean ideas” group activity is a valuable component of this seminar.

These results are invalid since the three seminar groups discussed lean ideas during the TIMWOOD activity rather than formally during the “Develop lean ideas” section. More time was required for the TIMWOOD group discussion than allotted for in the original iteration of the presentation. The current version of the presentation allows more time for the “Develop lean ideas” activity. I think this activity will be a valuable component of future seminars. The final version of the presentation is discussed in Chapter 4 and can be found in Appendix IV.
Number of responses | Percentage of responses
--- | ---
Strongly agree | 4 | 17%
Agree | 7 | 31%
Neutral | 11 | 48%
Disagree | 1 | 4%
Strongly disagree | 0 | 0%

The following two questions were meant to give participants an opportunity to include additional information regarding the strengths and weaknesses of the seminar.

What were the strengths of this seminar?

Eleven respondents answered this question. The majority of respondents, 73%, indicated the strength of the seminar to be the amount of information. In general, these respondents indicated that they learned a lot. Additionally, two of the respondents liked the “open discussion” format and one respondent indicated the strength to be my presenting skills.

How can this seminar be improved?

There were six responses to this question. Below are summaries of the six responses:

- The presenter should have knowledge of what the participants do on a daily basis. This knowledge can be used to inform examples of lean opportunities within the group’s work.
- Food should be provided during the seminar.
- The seminar should be no longer than one hour.
- The seminar should walk the process of submitting a lean idea.
- The presenter should maintain control of participant feedback, allowing it only at certain times.
- Seminar groups should be large enough to facilitate meaningful group discussion.
REFERENCES


Jensen, Marc. "Lean Manufacturing as a Tool for Campus Sustainability." *Sustainability* (Mary Ann Leibert, Inc.) 6, no. 6 (December 2013): 315-319.


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