INSTITUTE OF INDUSTRIAL & SYSTEMS ENGINEERS

Chapter # 1

Council on Industrial and Systems Engineering

The New Industrial (and Systems) Engineering:

Case Studies—Integrated LeanSigma Black/Green Belt Certification Capstone Projects

Session Leaders

D. Scott Sink, Ph.D., P.E., Director, Integrated LeanSigma Certification Program, ISE at OSU

Maria Pandolfi and Gunnar Smyth—Health Care Flow Improvement Projects
Joseph Weger—Employee Engagement with Lean to accelerate continuous improvement in Manufacturing
Allen Drown—Risk Management (labor turnover/loss) with Knowledge Management Systems

Agenda

12:00 pm	Scott Tee-up Quick Review from Part I—the Framework for the Series
12:10	Maria and Gunnar: OSU Med Center and Mount Carmel
12:25	Joseph Weger: Peerless Saw
12:40	Allen Drown: Transmet
12:55 pm	Scott: Closing Comments
1:00 pm	Adjourn

ISE and IISE for Life—how IISE supports you for your entire Career…..

You can get involved in Societies, Divisions and also 'Affinity Groups' like Young Professionals, Industry Advisory Board and the Council on Industrial and Systems Engineering

Questions?

How We'll Handle

Please write your question in the webinar question web form. We will address as many as we can at the end of the webinar and send and email with follow up's to attendees for those not able to be responded to.

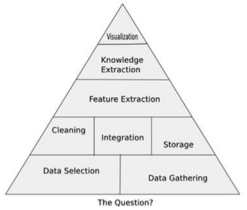
Chapter #1 Highlights—

IISE's First Chapter (1949)
and also the first Virtual IISE Professional Chapter (2016)

1. 186 Professional Members in Eastern Ohio but also from around the Country
2. Support, partner with the Youngstown State, Ohio University and Ohio State University Student Chapters.
3. Partner with the Industry Advisory Board, CISE, and the Young Professionals Group
4. Partner with our Dayton/Cincinnati Professional Chapter on our Annual IISE All Ohio Event and other things
5. 6 Timely, Valuable Webinars each year; topics developed from Voice of Member
6. 12 Monthly Memo's help Members get to know each other and keep members aware of upcoming opportunities AND also provide Self-Help Features on personal and professional mastery
7. quarterly GoToMeeting small group calls with members that focus on topics of interest from 'affinity groups'/segments of our members.

Design for the Series of Operational Analytics Webinars (series of 5 at this point)

Webinar #1: Foundations **7 Dec 2017 (and GLR Conference)**

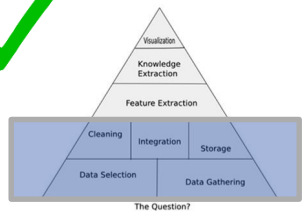


Share the Framework, the Models, the Abstractions, the Principles

Management Systems Model

Intel “Triangle” Model

Webinar #2: Foundational Data Role--Measurement and Analysis Planning 20 **March 2018**

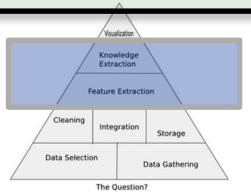


Measurement Planning using Value Stream Maps, Data Models derive from refining the Management System Model, The Data Management Role of ISE’s in Process Improvement Projects

Webinar #3: Best in Class ILSS Project Final TG’s 25 **April 2018**

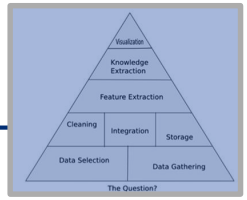
Showcase best in class projects, shine spotlight on Op Analytics

Webinar #4: Decision Support Role—M&A Execution 12 June 2018



Feature and Knowledge Extraction, Creating Chartbooks and VSM’s, supporting the evaluation phase of DMAIC projects and then also the Control Stage.

Webinar #5: Putting it all together 24 July 2018



Revisiting the Management Systems Model with Case Examples

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Improving Flow to Reduce Overall Wait in Healthcare

Green Belt Projects

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After College

PEPSICO
Supply Chain Analyst

After College

The Walt Disney Company
Business Integration Analyst

Past Experience

Whirlpool

Honeywell
Intelligrated

Past Experience

Disney Cruise Line

Walt Disney World
Where dreams come true

Improving Flow to Reduce Overall Wait in Healthcare

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Defining our Projects

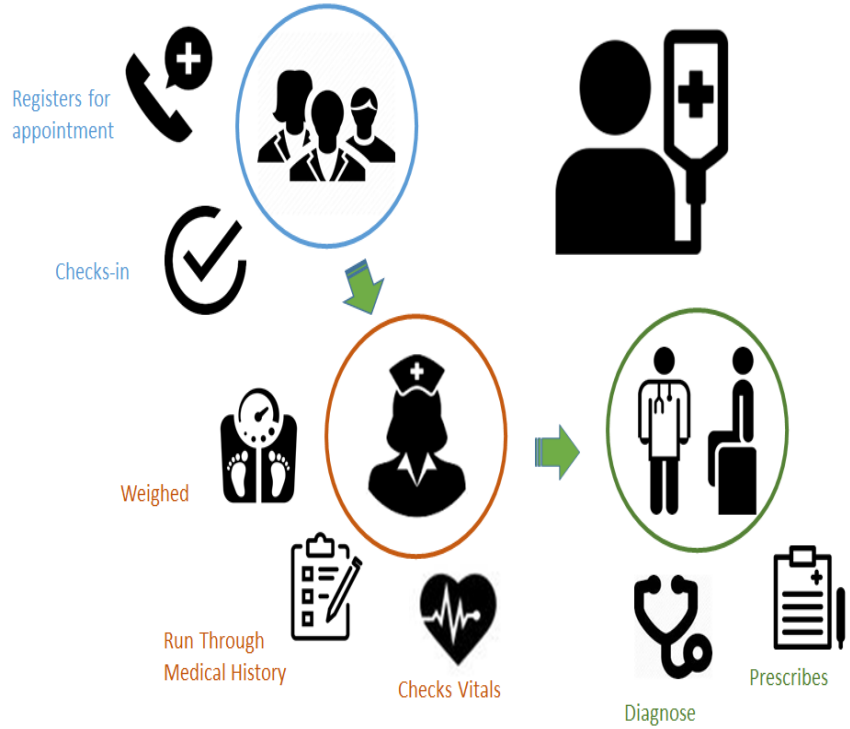
Problem Statement: Patient wait times were approaching 2+ hours despite appointment times of 40 min max. Appointments often fall behind resulting in overtime hours.

Project Goal: Reduce patient wait time so that 95% of patients wait less than 20 min total.

Clinic Process Flow

Problem Statement: Within the process there are delays that causes higher than normal workloads for provider, preceptor and nurses.

Project Goal: Decrease the number of bad flow days by improving the staff and patient schedule, patient arrival behavior, and other critical factors .



Improving Flow to Reduce Overall Wait in Healthcare

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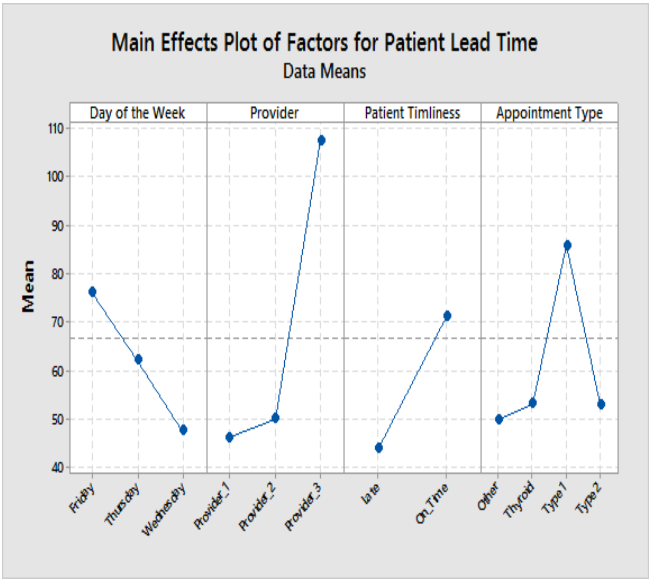
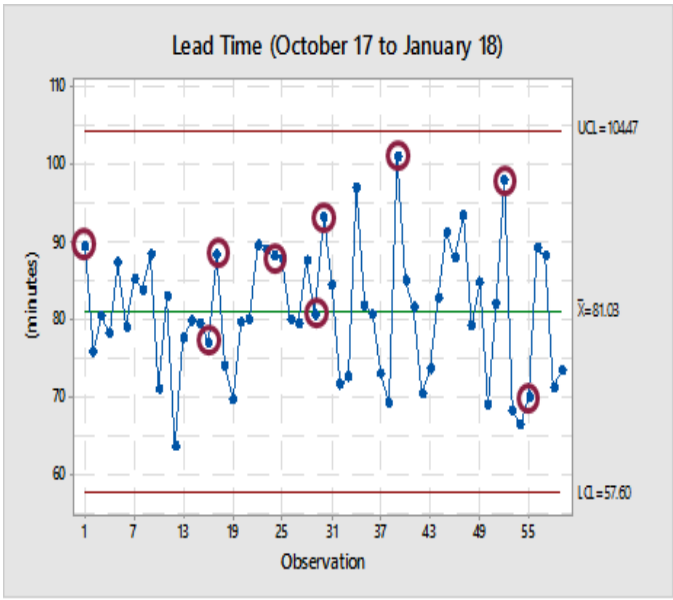
Measurement Systems



Current State
Lead Time: 56%
Spend more than 45 min at the clinic

Wait Time: 50%
Wait more than 20 min

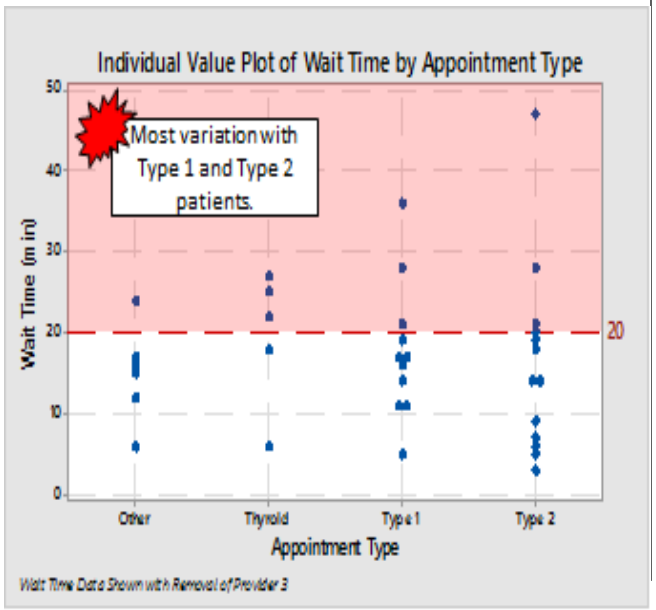


- ***Good Days (57%):***
  8 - 19 minutes of wait
  58 - 98 minute lead time
- ***Bad Days (15%):***
  14 - 23 minutes of wait
  79 - 112 minute lead time

"Fair" days account for the other 30%

Data: 59 Samples of Daily Patient Lead Time. (October '17 – January '18)

Diabetes Patients experience most variability in wait and lead time



What does this mean?

- Bad flow days occur ~15% of the time (about 1-2 times a week)
- Both patients & staff feel the effects of bad flow days:
  - Longer Patient Wait Times and Lead Times
  - Later Work Days for Staff (last patient doesn't check out until after hours)

Improving Flow to Reduce Overall Wait in Healthcare

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Analyzing the Data

3 Root Causes to Longer Wait and Lead Times

1. Product Family Mix and Provider Work Practices
2. Patient Device Downloads
3. Required Lab Work for Type 1 and Type 2 Diabetes Patients

Pain points adding an additional 2.45 to 17.3 min to each appt.

Team Identification of Process Pain Points

Failure Mode Effects Analysis of Team Identified Pain Points Impacting Clinic Flow

Pain Point	Severity	Occurrence	Detection	Impact	Factors	Time Added to Process	Counter Measure
Patient A1C not available when provider is ready (waits 3 – 15 min)	7	6	3	126	• Download resources not working • Lack of staff in lab to download	.63 to 4.73 min	Visual reminder to input A1C data
Patient paperwork not in door when provider is ready (waits 3 – 15 min)	7	6	3	126	• Triage nurses did not request labs • Lack of staff in lab to wait for A1C	1.04 to 7.76 min	Visual reminder for new patients to get PPW
Patient not ready to see the provider within first 15 min of appt.	8	3	5	120	• Patient has not completed when provider is ready	.375 to 2.81 min	MA to work specifically in the lab
Patients are not brought back within the first 10 min of arrival	8	2	5	80	• Unavailable exam room • Provider with another patient • Medical assistant must look at computer to see patient arrival	.4 to 2 min	Remind providers when they spend 20+ min with patients to free up rooms
Patient device download info not ready when provider is ready (waits 3 – 15 min)	7	6	3	126	• Patient needs lab work or device download • Unavailable exam room	Impacted in device downloads and A1C	Collect devices when patients arrive, send reminder message to patients to download

3 Root Causes to Longer Wait and Lead Times

1. Late Patients
2. Appointment Structure
3. Poor Communication and Coordination

*A **binary regression analysis** was used to determine the impact each factor above has on the output variable, flow ("good" or "bad"). Only days with high demand were analyzed.*

Factors	Impact	Treatable	Should We Treat It?	Goal	Solution
Patient Arrival	**High**	**Yes**	**Yes**	**Patients arrive early or on-time**	**Change appt. times to reflect when patients should arrive**
Communication and Coordination	**High**	**Yes**	**Yes**	**Be Proactive**	**Implement "Team Huddles"**
Total Lead Time	Medium	Yes	No	N/A	N/A
Resident-to Preceptor Ratio	Medium	Yes	Possibly	Lower Resident-to-Preceptor Ratio	Strategically schedule preceptors when needed
No-Shows	Medium	Yes	Possibly	Decrease no-shows	??
Appointment Structure	**Medium**	**Yes**	**Possibly**	**Appointment slots match exam times**	**Create larger time slots for patients**
Non-English Speaking Patients	Low	No	N/A	N/A	N/A
Patient Type Variation	Low	No	N/A	N/A	N/A

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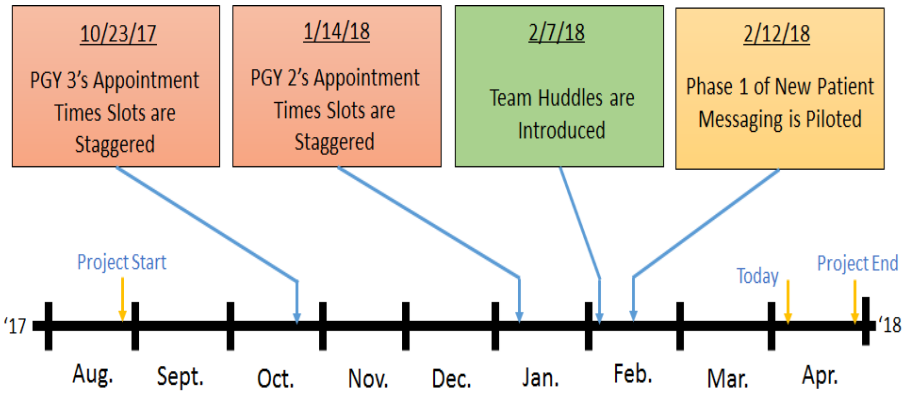
Improvement Implementations

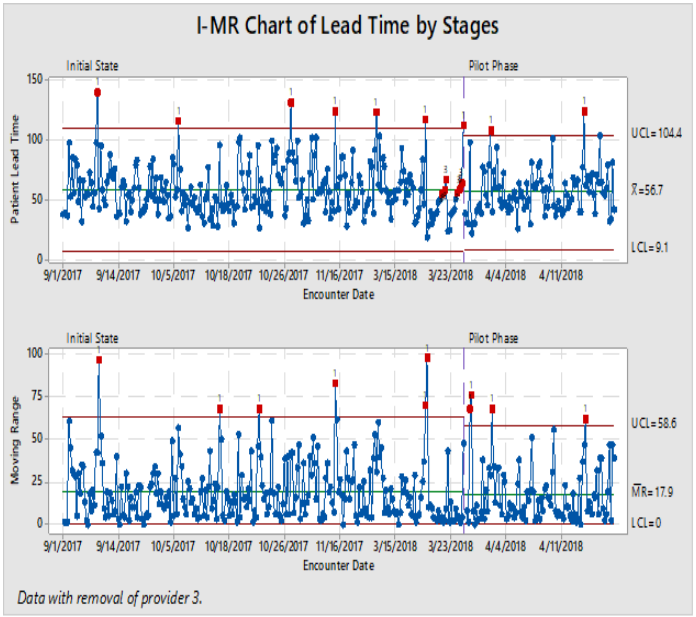
1. Visually Tracking Patient Progress
2. Collecting Patient Devices Upon Arrival
3. Diabetes Patient Reminder to Download Devices Prior to Appointment

Pilot Phase of Solution Elements

- Lasted 3 weeks allowing 9 potential days of data capture
- All solution elements used on 4 low appt. demand days



No Statistical Difference in Lead Time

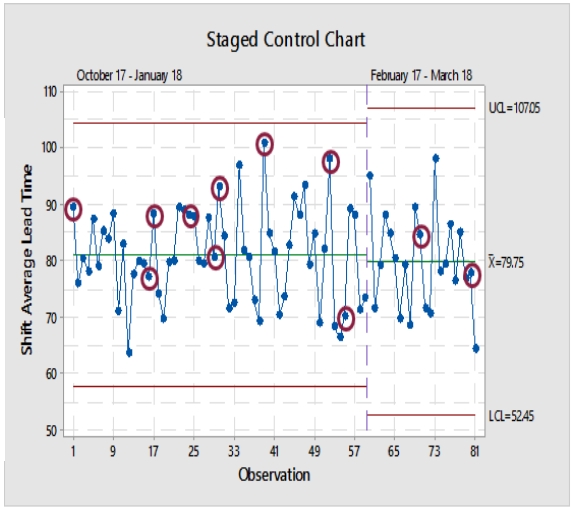


***Pre-Improvement Data*:**
59 Samples of Patient Lead Time.
(October '17 – January '18)

Bad Days (15%)

Bad Days (9%)

***Post-Improvement Data*:**
21 Samples of Patient Lead Time.
(February '18 – March '18)



Improving Flow to Reduce Overall Wait in Healthcare

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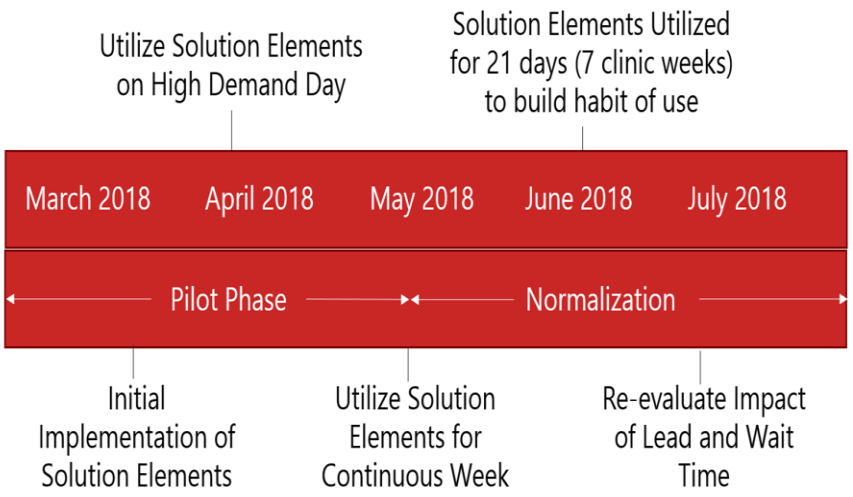
Ensuring Sustainability

Control Plan for Continuous Use of Solution Elements



Projected Impact After Continuous Use

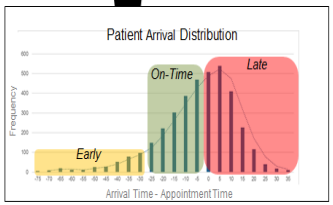
Projected Reduction in Process Time After Normalization of Solution Elements Utilizing "Time Added to Process" from FMEA		
Pain Point	*Factors Targeted with Solution Elements*	*Projection Reduction in Process Time*
Patient A1C	2 out of 3 factors targeted	1.04 to 7.76 min
Patient Paperwork	1 out of 2 factors targeted	.375 to 2.81 min
Patient Device Downloads	1 out of 3 factors targeted	.63 to 4.73 min
Total Projected Reduction in Process Time: 2.05 – 9.23 min		

Initial State

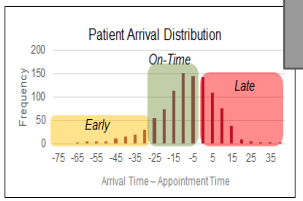
Early	On Time	Late
13%	37%	50%

Early	On Time	Late
11%	52%	38%

Final State



4400 samples from February '17– July '17



1037 samples from February '18 – March '18

		Wait for Exam	Total Exam Time	Wait for Check-out	Total Check-out Time	Total Time	Wait Time
Pre-Change	Median	4.0	32.5	2.0	5.0	78.6	**9.6**
	95th %ile	39.6	74.3	19.3	22.9	133.5	81.0
Post-Change 1	Median	3.1	33.0	2.1	4.9	78.2	**8.6**
	95th %ile	35.9	73.5	20.5	24.8	128.4	80.4
Post-Change 2	Median	2.8	35.1	1.2	4.5	78.3	7.4
	95th %ile	36.9	77.0	18.3	23.2	131.1	76.7

Pre-Change Data: 3342 Samples (February '17 – October '17)

Post-Change #1 Data: 2302 Samples (October '17 – January '18)

Post-Change #2 Data: 2143 Samples (January '17 – March '18)

Late Patients

Initial State: 50%

Final State: 38%

Most patients were late

Wait Time

Initial State: 9.6 min

Final State: 7.4 min

Patients are given more value-add time

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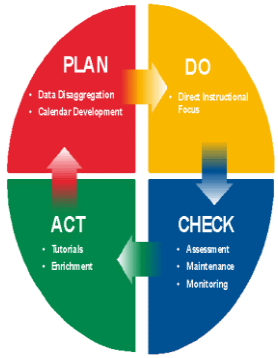
About Me

Name: Joseph Weger
Year: 4
Major: Industrial Systen
Engineering
Track: Manufacturing
From: Cleveland, Ohio
Hobbies: Skiing, Hockey, and Baseball

Past Experiences:

- Manufacturing Engineer intern at Libra Industries
- Service Operations Intern Bruner Corporation



peerless

Project Background

What is Peerless Saw?	Peerless is an ESOP-run saw manufacturer that produces custom-made industrial saws ranging from 4” to 40”.
What are the project requirements?	The executive sponsor at Peerless wanted to increase employee engagement, lean culture, and create a continuous improvement system within the company.
What the intended benefits?	The company hopes the process implemented gets employees more engaged in the company and will bring collaboration and idea spreading throughout the plant. Peerless also has a goal set for under $100,000 of total rework that this process will help to achieve.

Design of system through to Implementation

How the process was constructed

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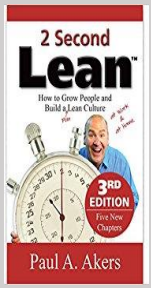
Benchmarking: elements from Transmet's similar "Walk and Talk" process

Lean Foundations: production waste identification



Background Research: methodology of the process.

PEERLESS

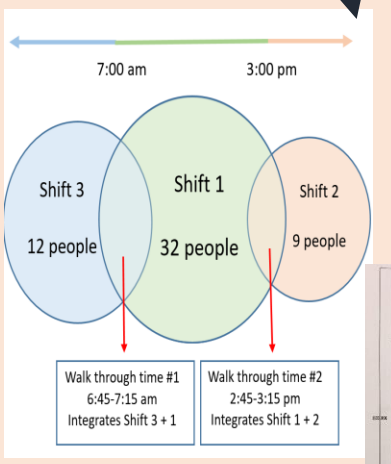
Executive Sponsor Requirements: process must be made in respect to the requirements

Design of the Program

Employee Education

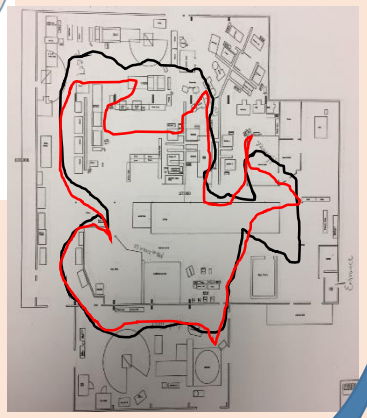
How the process is run

Continuous Improvements



Process Awareness

Collaboration



Idea Spreading

Communication

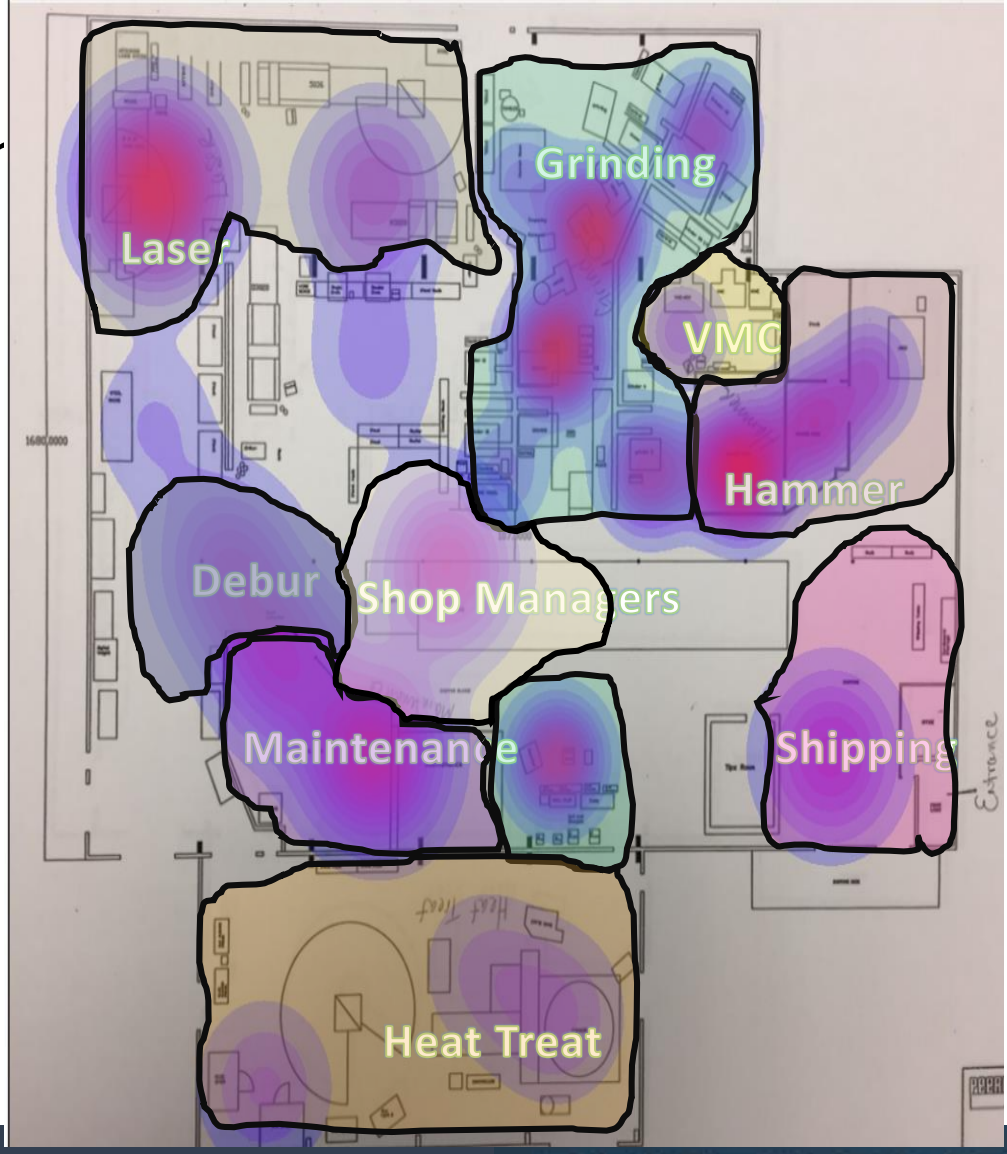
Improvement Documentation/ Monitoring

Define → Concept → Design → Implement → Optimize → Verify

PEERLESS

What is different in the orgar

- Engagement in lean operations from the walkthrough system breeds collaboration and continuous improvement.
- Employees make lean simple and can identify how waste manifests itself within the plant floor and operations.
- Improvements have flourished throughout all the different plant floor operations and office.
- All different employees run the walkthroughs and are engaged in leadership roles.

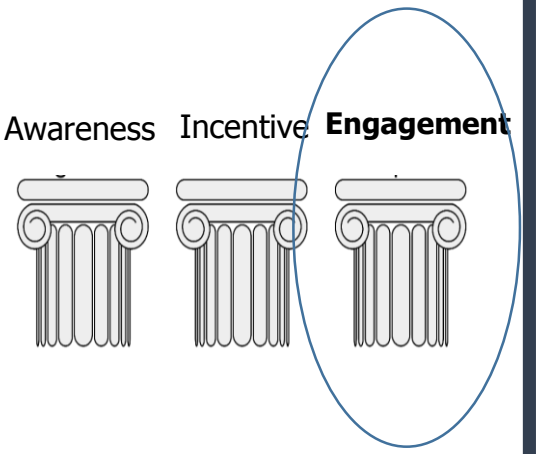


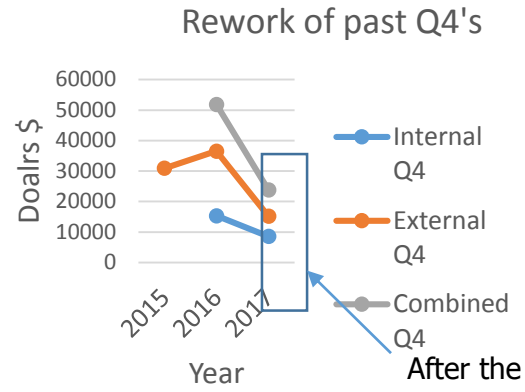
Define Concept Design Implement Optimize Verify

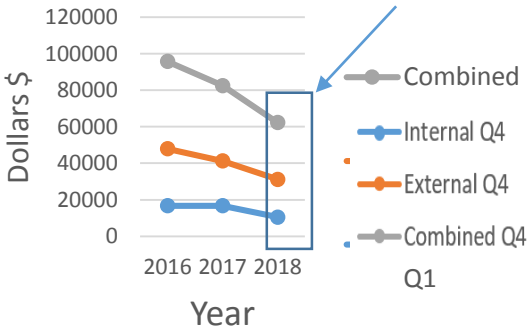
PEERLESS

How did the project effect other performance metric dials in the company?

Actions by Peerless to reduce rework and obtain a goal of under $100,000 in annual rework.

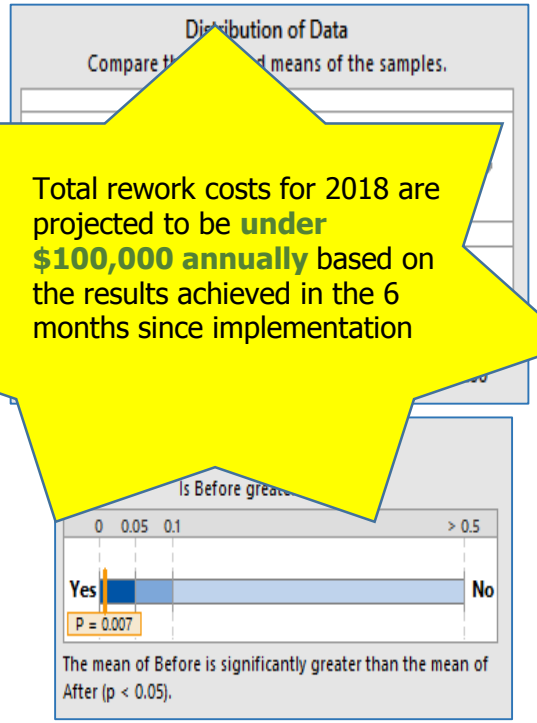






After the process was implemented

Total rework costs for 2018 are projected to be **under $100,000 annually** based on the results achieved in the 6 months since implementation

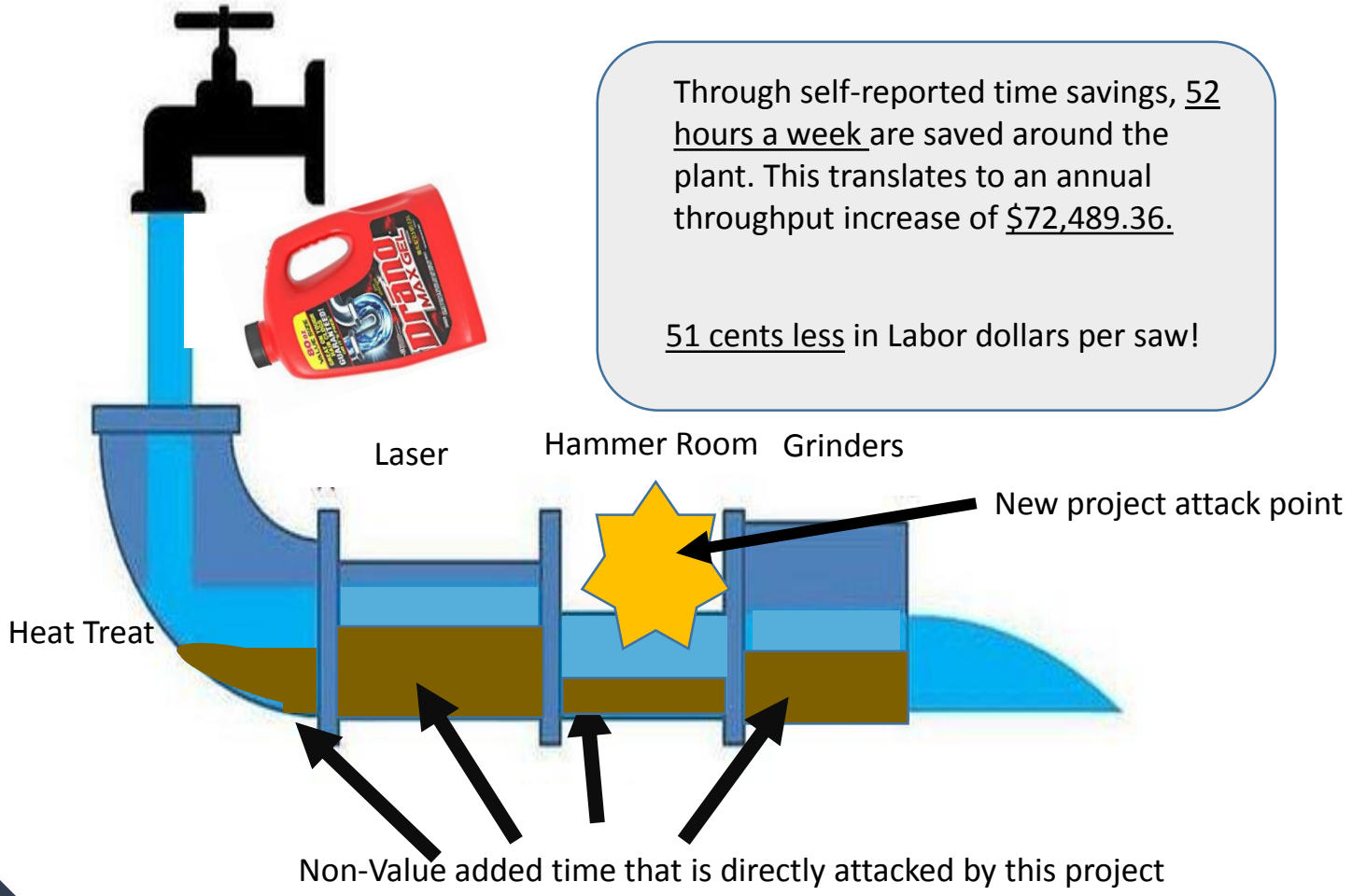


Statistical and practical difference in combined rework.

Define | Concept | Design | Implement | Optimize | Verify

PEERLESS

How does this project tie in with the operational goals and future projects of Peerless?



Key Takeaways

- Individual operators know their processes best. Engaging and empowering them to become creative and provide impact to the company is a very powerful tool that can be applicable in many manufacturing and transactional settings.

- Educating employees using universal terms in an clear, easy, concise manner is critical to understanding. Lean elements can be simplified to "learning to see waste" and "how to fix it". Once the groundwork is done you will be amazed by the creativity and improvements from all different types of employees.

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IISE Webinar (April 2018)

Transmet Process Maturity Level Improvement

Allen Drown – Project Lead and Belt Candidate

Justin Clarke & Robin Gates– Project Sponsor

Scott Sink – Project Coach

Agenda

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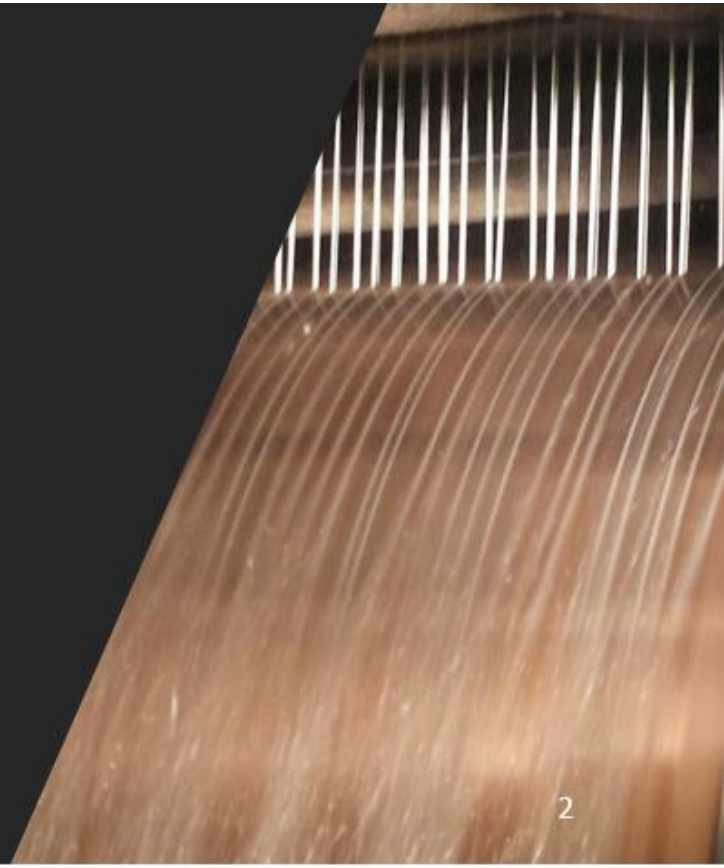
"SHAPE MAKES A DIFFERENCE"™

Purpose:

- To provide plans for implementation of Standard Work Knowledge Dashboard for use by workers on the Production Lines

Objectives/Topics to be covered:

- About Me
- Process Maturity Analysis
- Creating a Modern Knowledge Management System
- Creating a Modern Preventative Maintenance Program
- Conclusions



About Me

TRANSMET CORPORATION
RAPID-SOLIDIFIED METALS
FLAKES • FIBERS • SPHERES • OTHER
"SHAPE MAKES A DIFFERENCE"™

Name: Allen Drown

Hometown: Cleveland, Ohio

Education: Industrial Engineering, May ‘19

Upcoming Plans: United Airlines (CIEO Group, Co-op Summer & Fall)

Interests: Humanitarian Engineering, Robotics, former IISE VP of Operations for OSU Chapter

Project Overview

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"SHAPE MAKES A DIFFERENCE"™

Motivation

Market outlook predictors show an increase in demand for their products. The company is looking to increase production of it's products.

Problem Statement

In order to ensure quality expected by their customers, the company needs to reduce the risk of lost process knowledge in the event of process owner turnover.

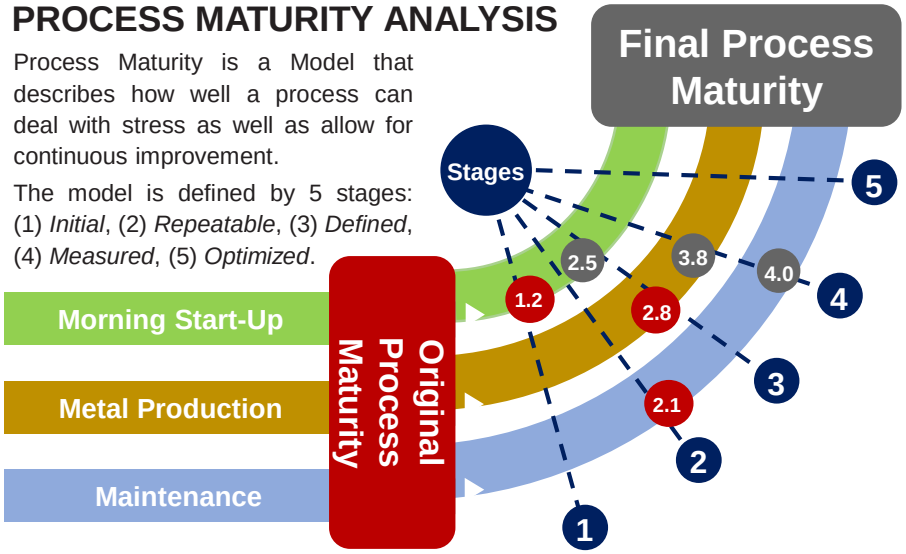
Objective

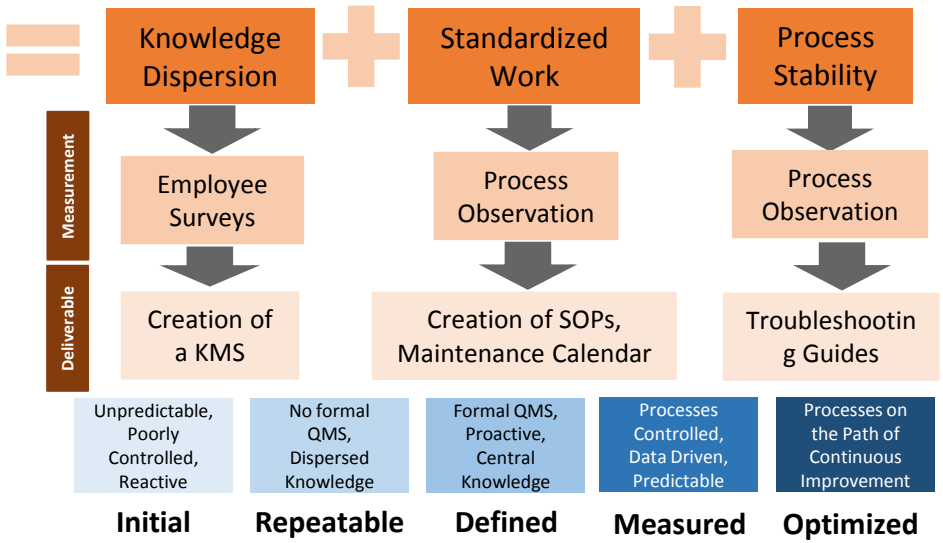
Create a Central *Knowledge Management System* (KMS), though a *Process Maturity Framework*, to control for human and process variation and failures.

PROCESS MATURITY ANALYSIS

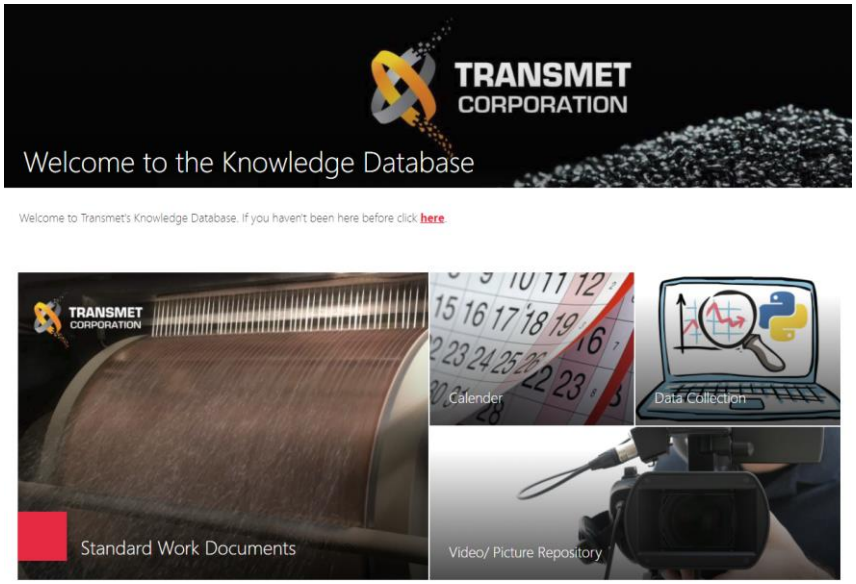
Process Maturity is a Model that describes how well a process can deal with stress as well as allow for continuous improvement.

The model is defined by 5 stages: (1) *Initial*, (2) *Repeatable*, (3) *Defined*, (4) *Measured*, (5) *Optimized*.





Knowledge Management System Design



- Central Knowledge Database Dashboard hosted through SharePoint 365
- Optimized for accessed on the Microsoft Surface Tablet
- Modernized Standard Work Documents by making technical Details in simple English and incorporating Visuals
- Creation of a “Smart” Calendar for TPM and SMED activities

Preventative Maintenance Calendar

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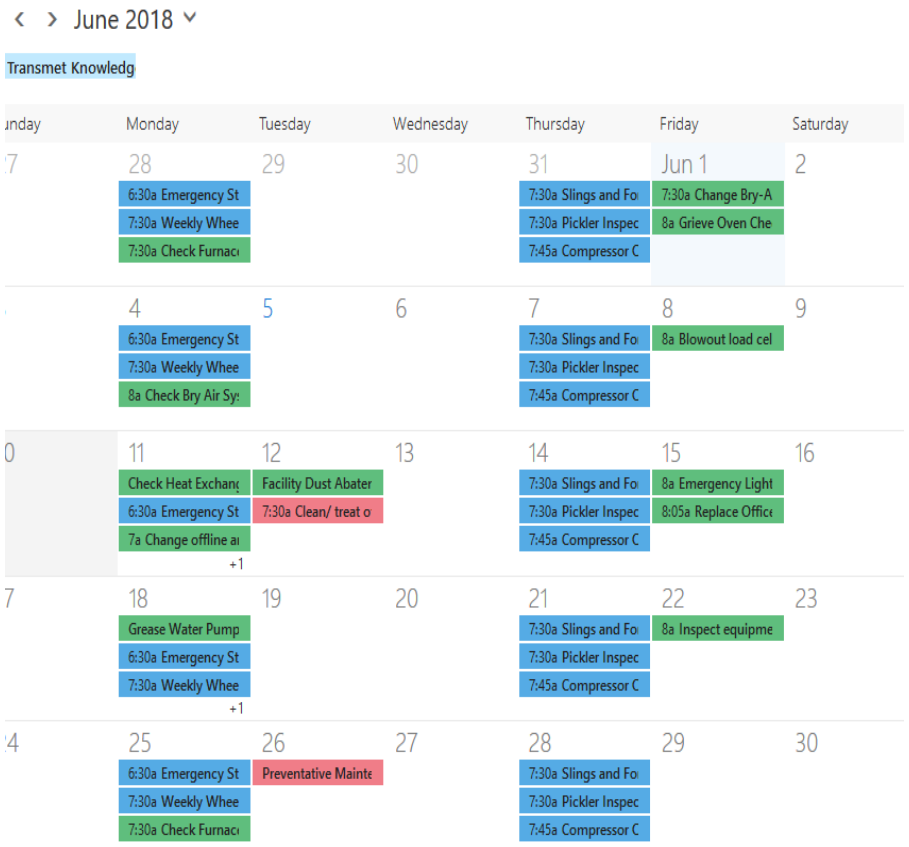
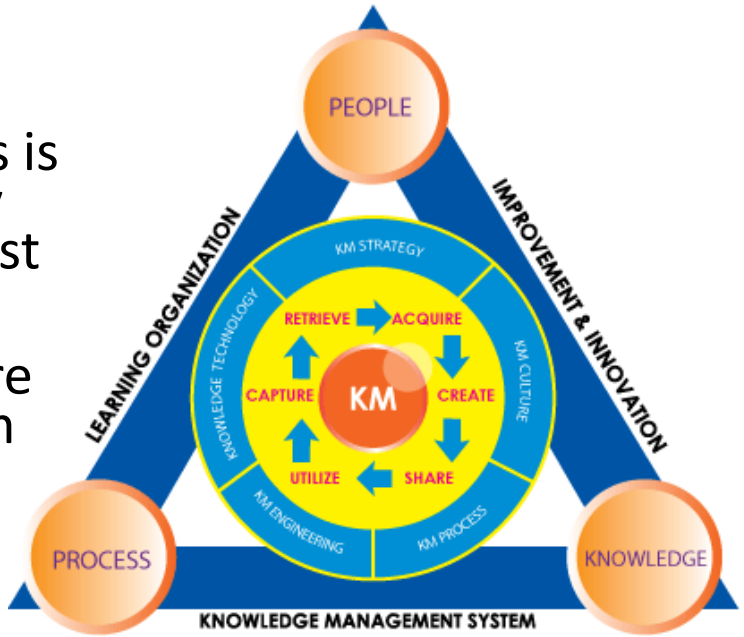
"SHAPE MAKES A DIFFERENCE"™

- Biggest problems occurred with delays because of Machine Break-downs
- Creating Standard Work Documents on preventative maintenance and how to fix downed systems
- Preventative maintenance now housed on a Company Wide Calendar accessed through the KMS dashboard
- Calendar Sends Email reminders to people tasked to complete those jobs
- SOPs attached to calendar events



Conclusions

- Creating Standard Work Documentation is not as easy of a task as I thought it would be. There is much variability in processes that is needed to be accounted for.
- Having a set schedule for machine repairs is important as the company had two easily preventable machine breakdowns this past year that costed them a lot of money.
- Transmet has an amazing company culture that allows for its employees the freedom to innovate and improve processes.
- Convincing people that an IT implementation would be useful for the company is a tough sell
- Involving Employees in the project is very important to get good information and to gain trust



Questions

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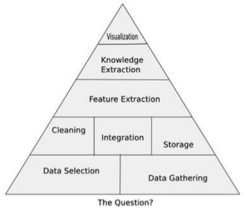
Design for the Series of Operational Analytics Webinars (series of 5 at this point)

Webinar #1: Foundations **7 Dec 2017 (and GLR Conference)**

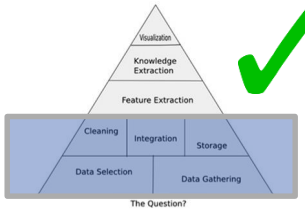


Share the Framework, the Models, the Abstractions, the Principles

Management Systems Model

Intel “Triangle” Model

Webinar #2: Foundational Data Role--Measurement and Analysis Planning 20 **March 2018**

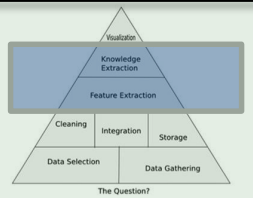


Measurement Planning using Value Stream Maps, Data Models derive from refining the Management System Model, The Data Management Role of ISE’s in Process Improvement Projects

Webinar #3: Best in Class ILSS Project Final TG’s 25 **April 2018**

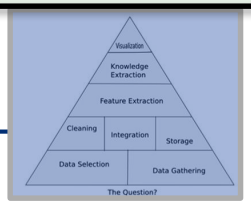
Showcase best in class projects, shine spotlight on Op Analytics

Webinar #4: Decision Support Role—M&A Execution 12 **June 2018**



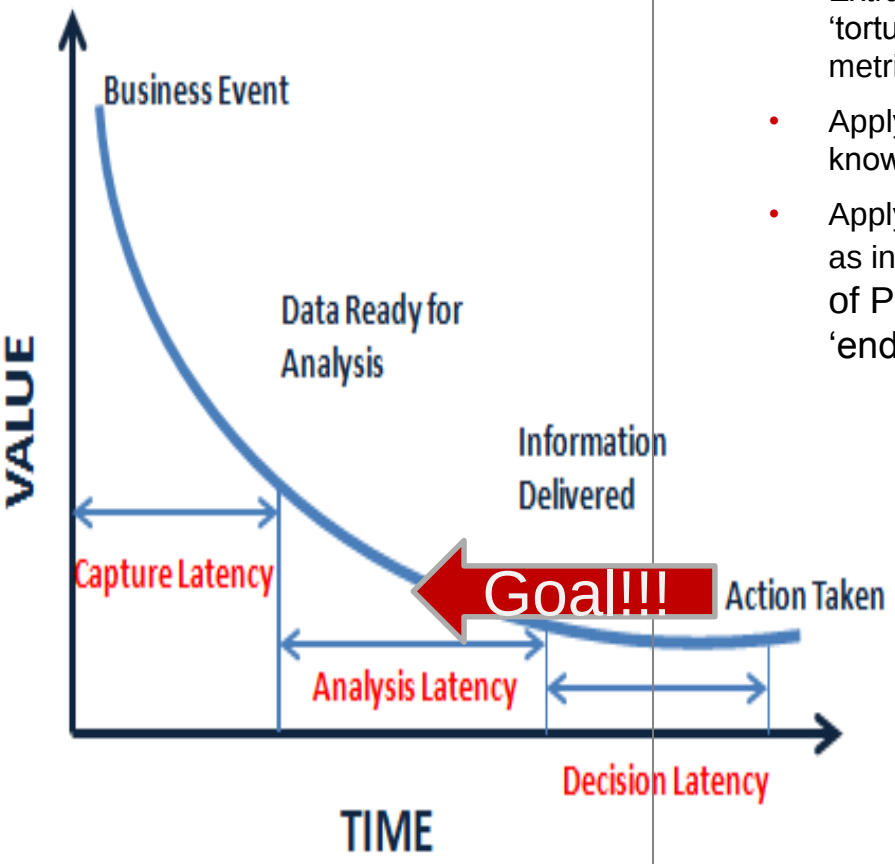
Feature and Knowledge Extraction, Creating Chartbooks and VSM’s, supporting the evaluation phase of DMAIC projects and then also the Control Stage.

Webinar #5: Putting it all together **24 July 2018**

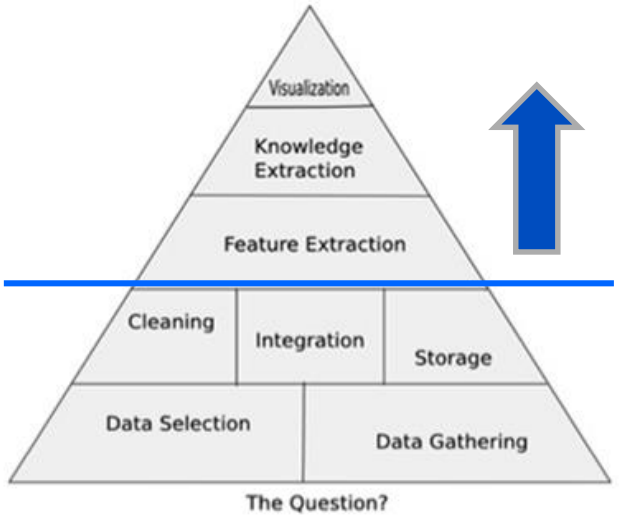


Operational Analytics—the Whole Chalupa…

Provoke timely and effective decisions and actions (shorten 'latency')



- **"Above the line" analyst role**
  - Extract features based on questions you have to answer by 'torturing' the data until it speaks to you and others. Pick right metrics of interest!!
  - Apply curiosity & business acumen to data & analyses – create new knowledge, insights, 'aha's'
  - Apply data visualization techniques to aid in telling the right story – as in life, so in business: the best story wins …Develop the Art of Powerful Visualizations and stay focused on driving the 'end game'



Upcoming Lunch and Learn Webinars from Chapter #1

Upcoming Lunch and Learn Webinars: FREE, over lunch time, Usually Tuesdays, GoToWebinar Format!!

- **19-22 May: IISE Annual Conference, Orlando, Universal Loew's International**
- **12 June: Operational Analytics Part III—The Top Half of the Intel Analytics Triangle—Decision Support**
- **24 July: Operational Analytics Part IV—Putting it all Together, how to master Operational Analytics and drive faster Improvement**
- **21 Aug: Balancing your ISE and ILSS Technical Skills with the right 'soft skills': Mastering Change Leadership and Management**
- **6 Sept. CISE Career Choice Points #3 (Jim Dobson, Disney; Rudy Santacroce, CarlsonRTKL (health care architecture firm); Kelli Franklin-Joyner, UPS.**