Operations Management

Using the advanced business tools of Lean, Six Sigma and Data Mining for successful nonprofit operations

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The challenge

I’m sorry but you are going to have cut your budget by 15%

We missed submitting our grant on time - $50,000

Our billing system keeps making errors

I seem to have too many staff one day and not enough the next.
The Opportunity

- Six Sigma
- Lean
- Analytics and Data Mining

- “Operations Management”: A disciplined and scientific approach to management using data, math, logic, psychology and sociology
History of Quality

- Craftsman
- Inspection
- Division of Labor
- Analytics
- SPC
- Deming PDCA
- 6σ
- Toyota PS
- Isugawa
- Lean

Opus College of Business • University of St. Thomas
Excellence in Operations

Technical Expertise

Leadership & People Skills

Operations Management
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Statistical Tools
Lean Projects and Tools

- Value stream mapping
- Geographic mapping (spaghetti diagrams)
- 5 S
- Standard work
- Checklists
- Visual Management
- Error Proofing
- Kaizen Events
Problem Solving using Cause and Effect Diagrams
Problem Solving

• Used when ongoing operations do not perform well
• Is an analytical approach which does not focus directly on people as cause
• Can be used individually or by a group
Problem Solving Steps

1. Describe the situation accurately
2. Identify the scope of the problem solving activity
3. List and group difficulty to form “issue” areas
4. Arrange graphically into fishbone (Cause and Effect, Ishikawa diagram)
Problem Solving - 2

5. Identify alternative solutions for each issue area.
6. Identify additional information needed to evaluate solutions
7. Collect data as needed
8. Plot alternatives on Implementation/Impact graph
Problem Solving - 3

9. Develop recommended action and metrics to monitor
10. Present recommendation with justifications
   - Supervisor
   - Staff
11. Implement and monitor
Implement using PDCA

1. Plan your corrective action

2. Do it

3. Check to make sure it is working properly

4. Act to maintain it (Adopt, Adapt, Abandon)
Problem Solving using a Cause and Effect Diagram

Difficulties:
1
3
7

Issue

Problem area

Difficulties:
2
8
9

Issue

Problem area

The problem
Problem Solving - Solutions

Difficulties:

1. Alt. Solution $\rightarrow$ Data $\rightarrow$ PDCA

3. Issue

7. Alt. Solution

Alt. Solution

Difficulties:

2. Issue

8. Issue

9. Problem area

The problem
Samantha Smith is the executive of Sunflower theater and she is very angry. A theater patron approached her at a restaurant and complained about her theater. “You know, I have called your ticket office three times last week and I was put on hold for over 20 minutes. I would still like to support your theater but I might have to switch if I can’t get through your phone system.”

Brian Anderson is the theater administrator and recently upgraded the computer information system and phones. The receptionist, Millie, who handles tickets and other administrative tasks has been an excellent employee of the theater for over 25 years. However she has recently had an argument with the theater’s new artistic director, Sam Bernardo and told Brian she would need a raise if she had deal with him.
Cause and Effect Diagram – phone problems

Samantha Smith is mad
Upgraded phone system
Customer put on hold 3 times for 30 minutes
Receptionist is older
Sam Smith might lose a patron

Receptionist does not get along with artistic director
Receptionist wants a raise
Upgraded computer system

Customers put on hold too long
Phone - Issues

• Receptionist is older
• Receptionist does not get along with artistic director
• Receptionist wants a raise

Receptionist skill and attitude

• Sam. Smith is mad
• Customer put on hold 3 times for 30 minutes
• S Smith might lose a patron

Technology
• Upgraded computer system
• Upgraded phone system

Customer Dissatisfaction

Customers put on hold too long
Phone – Alternative Solutions

Receptionist skill and attitude
- Counseling, coaching
- Replace
  - Study on phone calls
  - Study on overall customer satisfaction

Technology
- Test and repair equipment
- Training
- Add staff

Customer Dissatisfaction
- Customers put on hold too long
Process Mapping - Flowcharting
A process
Another process
The Process Box

- A process converts one or more inputs to an output
- Theater process examples:
  - Move/transform things – e.g. set construction
  - Move/transform information – Volunteer contact information into a database
  - Move people – from lobby to seats
Process Mapping Basics

- Process
- Input and Output
- Decision Points
Process mapping Basics - 2

- Need to clearly identify the environment of the process
- If the process is too complex - break it into multiple processes
- A process can only have one output but it may have multiple inputs
- A process often has the ending “ing” – (e.g. recruiting, transporting, injecting etc.)
Processes need resources and owners

- People (who, how much time)
- Information (what, from where)
- Supplies (what, quantity)
- Services (what, timeliness)
- Facilities (where, how much time)
- Process owner
  - Assures resources are adequate
  - Measures and optimizes
Multiple processes

Note: “Flowcharting” and “Process Mapping” are interchangeable terms
Making an appointment for an acting class

Answer request for appointment

Log on to Info System

Caller Status

Make Appointment

Enroll Caller

New

Current
Flowcharting – Resources

Answer request for appointment

Log on to Info System

• Receptionist - 3 minutes
• Phone information
• Admission form
• Receptionist desk

Caller Status

Enroll Caller

New

Current

Make Appointment
Low Hanging Fruit
The two printers in the billing department
Theory of Constraints

• Identify Bottleneck or Constraint
• Exploit the constraint (make it work better with no additional resources)
• Synchronize other resources to the Constraint
• Elevate the Constraint (make it work faster – more resources)
• Find the new Bottleneck and reapply this theory
• Emergency Department Example
ER Model Analysis

• Current state
  – Value added time = 980 minutes
  – Patients in system per hour = 45

• Improved State
  – Value added time = 1031 minutes
  – Patients in system per hour = 49

• Financial
  – Nurse cost per hour = $40
  – Revenue per patient per hour = $500
  – 4 patients additional per hour yields $2,000 per hour in new revenue
  – No other added costs
Lean Thinking

• Apply **Five** Simple Principles:
  – Define **value** from the end customer’s viewpoint
  – Map the **value stream**
  – Make the product **flow**
  – So the customer can **pull**
  – As you manage toward **perfection**

The Value Stream - Watching Football

- Sequence
  - Commercial
  - Huddle
  - Play
  - Ball moves
  - 1st down chain moves
- Value = Play
- Normal 3 hour game contains about 30 minutes of plays: Value stream = 30/180 or 17%
- Increase in no huddle plays = value stream improvement
To add value - Reduce waste

- Transportation
- Motion (searching for supplies)
- Waiting
- Over Processing (doing more than is needed)
- Defects
- Inventory
- Over Production (redundant gathering of information)
- Underused employee skills
Flow

or
Flow

or
Tools for Improving Flow

• Value stream mapping
• Geographic mapping (spaghetti diagrams)
• Fishbone
• 5 S
• Standard work
• Checklists
• Visual Management
• Error Proofing
Spaghetti Diagram – Mail Room

To Improve – reduce the long arrows
5 S Process

- Sort: Clearly distinguish needed items from unneeded and eliminate the latter.
- Straighten: Keep needed items in the correct place to allow for easy and immediate retrieval.
- Standardize: The method by which "Sort," "Straighten" and "Shine" are made habitual.
- Sustain: Maintain established procedures.
- Shine: Keep the workplace neat and clean.
Standard Work

- The least wasteful way discovered to complete a process
- Procedure performed the same way every time
- Contingency plans/pathways for failure modes
- Examples
  - Written work instructions
  - Job Procedures
  - Visual process boards
- “The best way we know today – but it will be improved tomorrow”
- Standard work and custom work – every job is a mix
Checklists

- Van Halen and the brown M and Ms
Visual Management

- Self explaining, ordering, regulating
- Clearly define the normal or desired condition
- Examples
  - Signals (Ondan)
  - Floor markings
  - Charts - Graphics
  - Replenishment cards
  - Color Coding
- Point of service supplies
Poke Yoke – Error Proofing

Do you want to save this file before exiting?
Kaizen Events
(Rapid Process Improvement Workshops – RPIW)

- Short time periods (1/2 day to 5 days)
- Use simple tools
  - Spaghetti diagrams
  - Process diagrams – value streams
- People who perform the process or observers
- Focus on immediate recommendations for change
- Necessary resources available immediately
- PDCA on changes
- Many Kaizen events per year
Business Intelligence and Analytics
Data Warehouse

ETL
Extract
Transform
Integrate
Cleanse
Load
Maintain

Data Warehouse

Data Mart

Performance Reporting

Data Mining

Automated Business Rules

External Databases

Main operating systems

Financial Systems

Support systems (e.g. HR etc.)
Knowledge Mining

- *Intelligent methods* are applied to extract *data patterns*
- Frequent Patterns
  - Association (Market Basket)
  - Cluster Analysis
- Prediction
  - Regression
  - Decision Trees
  - Neural Networks
- Wild West for software developers
Example – Cluster Data
Data Mining Examples

$600
Data mining for Donors

Existing Donors

More Donors

More funds

Cluster using Sorting

Specialized Events

Data base in Excel
Take home tools

• Use a fishbone to solve a current problem

• Speed up processes by eliminating bottlenecks

• See the seven wastes and fix them

• Do data mining for donors
Resources

UST Executive Education

Introduction to Lean

LSS Green Belt

LSS - Black Belt

Analytics with Excel
Thank You

“May the roads rise up to meet you,
May the wind be always at your back, and
May your operations always be successful!”

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