Lean Six Sigma Approach to Project Efficiency

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- Daniel Trottier: Manager, Enterprise Services
- Sébastien Dignard: Assistant Director, CCS
Agenda

- Presentation objectives
- Situational overview
- Choosing Lean Six Sigma Methodology
- Defining Lean Six Sigma
- Lean Six Sigma process: definitions and examples
- Lessons learned
- Workshop
Presentation Objectives

• Learn the basic foundations, the terminology and knowledge of the Lean Six Sigma approach

• Be able to see how the approach is applied to concrete projects within the university context

• Have a good understanding of how the Lean Six Sigma approach could produce tangible benefits for their operations
uOttawa Facts

- World’s largest bilingual university (French/English)
- Located in Ottawa, Ontario, Canada (Nation’s Capital)
- 40,000+ students
- 250 undergraduate and 200 graduate programs in 10 faculties
- One of Canada’s top 10 research universities
- Over 5,100 staff members
- Approximately 280 IT staff in central IT (CCS), faculties and services (50/50 split)
CCS Facts

- Central Computing and Communication Services at the University of Ottawa
  - Service Management
  - Student Services
  - Enterprise Services
  - Infrastructure

- Registrar has IT resources to support their operations and to provide data both internally and to the faculties
Admissions Facts

• September 2012 Admissions
  64,000 applications / 32,000 offers

• 30,000 admitted annually

• Office composed of 3 main sectors:

  **Info Admissions**: first contact with student/answer students questions, etc.
  **Logistics**: scanning, indexing, calculation of average, etc. – more technical duties
  **Evaluation**: where the decision is made/sector composed of 10 admission officers
Situational overview

- In 2011, CCS began looking for a framework to increase the efficiency of project prioritization, analysis and implementation.

- CCS works with a variety of clients across all facets of the university environment (faculties and services).

- Each client brings a unique set of challenges and opportunities.

- Faculties and services are willing to collaborate with CCS (adapt tools developed in faculties for use in other sectors).
Challenges we were facing

• Change Management

• Project prioritization

• For the same goals, faculties have different processes and tools

• Staff don’t necessarily understand the process objectives

• Relations between faculties/services and CCS was problematic
Overarching objectives

- Improve student experience
- Increase professor and staff satisfaction
- Increase service quality
- Reduce cycle times
- Reduce process variance
- Reduce waste (paper and other materials)
Choosing Lean Six Sigma

- Seeing Lean Six Sigma applied by Xerox

  - Successful implementation of docUcentre at uOttawa provided a first-hand glimpse of what the methodology could do for our operations and processes

  - From a 1M$ deficit per year to breakeven in 18 months

  - Opportunity for knowledge transfer between Xerox and the University
## Combining Two Approaches

<table>
<thead>
<tr>
<th>Lean SPEED Enables Six Sigma Quality (faster cycles of experimentation / learning)</th>
<th>Six Sigma QUALITY Enables Lean Speed (fewer defects means less time spent on rework)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td><strong>Goal</strong></td>
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<tr>
<td>reduce waste and increase process speed</td>
<td>improve performance on customer CTQs (Critical to Quality)</td>
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<tr>
<td><strong>Focus</strong></td>
<td><strong>Focus</strong></td>
</tr>
<tr>
<td>identify non-value add steps and causes of delay</td>
<td>use DMAIC process with various tools to eliminate variation</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td><strong>Method</strong></td>
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<tr>
<td>value stream tools, Kaizen events</td>
<td>1% to 3% dedicated as Deployment Mgrs and Black Belts</td>
</tr>
</tbody>
</table>
Overview: Lean Six Sigma Ecosystem

Black Belts, Yellow Belts & Green Belts:
- Subject matter expert on Lean Six Sigma methodology & tools
- Lead cross functional multi-disciplinary projects from start to finish
Explaining the Six-Sigma Approach

Video
DMAIC Project Methodology

- Clearly **Define** the problem area needing improvement
- **Measure** the process to establish baseline process performance
- Identify root causes to problem areas via data **Analysis**
- Generate, implement and pilot **Improve**ment opportunities
- Measure success by comparing improved process performance to baseline & **Control** the future state process to ensure that any deviations from targets are corrected before they result in defects
Applying the Lean Six Sigma Methodology to a project

Admission at the Faculty of Education
Define

• Identify Key Problem Areas

• Develop a Project Charter with the Project Focus, Key Metrics, and Project Scope

• Develop SIPOC map to identify the customer of the process as well as all the parties involved in the process

• Capture “Voice of the Customer” requirements through focus groups and interviews
**DEFINE phase: Project Charter**

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>Deployment Manager:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization:</td>
<td>Green/Black Belt:</td>
</tr>
<tr>
<td>Project Sponsor:</td>
<td>Date:</td>
</tr>
</tbody>
</table>

**Business Impact**
- Why should we do this? What is the benefit?
- What is the quantified value of the project ($$)?
- How does this project align with the business priorities; i.e. unit strategy, annual plan/outlook, PEP.

**Opportunity or Problem Statement**
- What "pain" are we or our customers experiencing?
- What is wrong or not working?
- Why do we think we can generate the value proposition described in the statement of Business Impact?

**Goal Statement**
- Specifically, what are we going to do and deliver?
- Do the performance improvement objectives and targets enable the Unit’s objectives, i.e. PEP, strategy, annual plan metrics?
- Benchmark performance levels?
- How will success be measured? What specific parameters will be measured? Define Y = f(x)

**Project Scope**
- What are the boundaries of the initiative (start and end steps of the process)?
- What authority do we have?
- What is not within scope?

**Project Plan**
- When are we going to complete the work?
- What are the major milestones/tollgates?

**Team Selection**
- Who are the team members?
- What is their role?
- How much of their time will be dedicated to the project?
DEFINE phase: Project Charter

- **Objectives**
  - Reduce manual steps in the process
  - Redistribute resources to more value added activities
  - Improve the student experience
  - Clearly define Faculty vs. Registrar’s roles

- **Scope**
  - In Scope: full admission cycle in Education; from the preparation for opening of admissions to student registration

- **Team**
  - 3 members of CCS
  - 4 members of the Registrar
  - 2 members at the Faculty
  - 1 LSS Black Belt
SIPOC – University of Ottawa Admissions – Faculty of Education (Draft Jan 14)

Suppliers
- Faculty Professors
- Province / Ministry
- Admissions
- Registrar webmaster
- Faculty webmaster
- OUAC (& webmaster)
- Financial Aid Office

Inputs
- Competency Exam
- Staffing for the Comp Exam
- # of funded spots
- Coordinator for Profile
- Evaluators of Profile
- Excel Spreadsheets
- Lists of items requiring f/u
- PDF Templates (SOE,)
- Website (Faculty, Registrar)
- OUAC open & close process & e-documents
- Line & email for inquiries
- Envelopes
- Scholarships Funds

Process
- Start
- Finalize Offering
- Meet Quota for Students Registered
- End

Outputs
- Offer of Admittance
- Registered Students
- Accepts / Declines
- Report to Ministry
- Reports for Part Time French
- Scholarships <10%
- Correspondence re: Language Comp Test

Customers
- Student

VALUE CHAIN PARTNERS
- Admissions
- Ontario College of Teachers
- Faculty Professors
- Faculty Staff

High Level Process Diagram (University of Ottawa Admissions)

May
- Finalize Offering (Division/teachables)

Jun
- Admissions documents (2 months)
- Stmt of Experience
- Access Forms
- Transcripts
- Requires approval

Revise
- Send to Admissions
- (link to OUAC)

Jun-Aug
- Put up link online ****
- Agree on Protocol (Admissions & Faculty)
- (formal Doc)

Sept
- Field calls & answer questions

Oct-Dec
- Establish Number of students by teachables

Sept-Sept
- Scholaships
- Admissions tests

Feb
- Evaluate SOE & RCF (Nov-Sept)

Mar-Sept
- Follow up to ensure students register

Jun-Sept
- Meet Quota for Students Registered

Sept
- END

Process Measures (x):
- Process Cycle time
- Inbound calls received
- In person visits
- Email Inquiries
- Forms Incomplete
- Hours worked / Overtime Hours

Output Measures (y):
- # applications received
- #admitted
- #Registered

uOttawa
Benchmarking

• Best practice assessments via university visits

• Peer to peer benchmarking
Voice of the Client

Student focus groups

• Since the reality between the English program and the French program is quite different, two distinct groups were created (Anglophone / Francophone)

• Students were asked to answer specific questions about the admission process but were also encouraged to give comments/suggestions
• Develop Process Mapping to better understand current situation and identify areas of inefficiency

• Develop a Data Collection Plan to identify data required to understand the current state of the process

• Collect baseline data
MEASURE phase: Process Map Draft
# MEASURE phase: Data collection plan

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Operational Definitions</th>
<th>Data Source and Location</th>
<th>How will data be collected?</th>
<th>Who will collect the data?</th>
<th>When will data be collected?</th>
<th>Sample size</th>
<th>Stratification factors</th>
</tr>
</thead>
<tbody>
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<tr>
<td>Workforce Management</td>
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<tr>
<td>2011/2012 Call Statistics By Month</td>
<td></td>
<td></td>
<td>Exists</td>
<td>Melanie</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2011/2012 Call Statistics By Phone Prompt by Month</td>
<td></td>
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<tr>
<td>2011/2012 Results by Month/ Hour of the Day</td>
<td></td>
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<tr>
<td>Call history by unique identifier? Time zone/where are the calls coming from and how many times in one number calling</td>
<td></td>
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<tr>
<td>For Staff what are their monthly results for calls handled, talk time, wrap up time and idle time, and avg call time</td>
<td></td>
<td></td>
<td>Exists</td>
<td>Melanie</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Call Flow / Process Map/ Queuing process/ Prompts/Messaging</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>How do they staff the phones</td>
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<td></td>
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<tr>
<td>Language requirements?</td>
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</tr>
</tbody>
</table>

Data Item: Data to Create or Exists, SME Contact For Data, Team Owner, Next Step.
• The objective of the analyze phase is to identify the “Critical Factors” impacting the process or service
Available tools for the Analyze Phase

Activities

• Propose Critical X’s
• Prioritize Critical X’s
• Conduct Root Cause Analysis on Critical X’s
• Validate Critical X’s
• Estimate the Impact of Each X on Y
• Quantify the Opportunity
• Prioritize Root Causes

Tools

• Pareto Charts
• C&E Matrix
• C&E / Fishbone Diagrams
• Brainstorming
• Detailed ‘As-Is’ Process Maps
• Basic Statistical Tools
• Non Value-Added Analysis
• Confidence Intervals
• Hypothesis Testing
• Non-Parametrics
• FMEA
• Box Plots
• Interaction Plots
• Multi-Vari Charts
• Chi-Square Analysis
• Simple & Multiple Regression
• Logistic Regression
• One-way and Two-way ANOVA
• ANOM
• Box-Cox transformation
• QFD-2
• Scorecards
• Excel Analysis Tools
\[ Y = f(x) \]

The output (\(Y\)) of a process is a function of several inputs (\(X's\)):

\[ Y = f(X_1, X_2, X_3, X_4, X_5, \ldots) \]

- Distance
- Weather
- Traffic
- Speed
- ???

This is the "Performance Measure", -or- "Output" - or- "Result"
Y = F(X) Storyboard

- Observed the Process/ Gathered Voice of The Process
- Collected key documents
- Highlighted specific areas of opportunity
- Created Critical X list and identified Top Root Causes
- Discussed effort vs. benefit
- Quantified the opportunity
### Official Documents Requested Statistics

**Note EDI: OUT OF SCOPE FOR THIS PROJECT**

<table>
<thead>
<tr>
<th>Poste/Fax</th>
<th># of requests by email/fax</th>
<th>Janvier</th>
<th>Février</th>
<th>Mars</th>
<th>Avril</th>
<th>Mai</th>
<th>Juin</th>
<th>Juillet</th>
<th>Août</th>
<th>Sept</th>
<th>Sept Est (2 weeks missing)</th>
<th>Nov</th>
<th>Déc</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>403</td>
<td>373</td>
<td>264</td>
<td>216</td>
<td>529</td>
<td>551</td>
<td>571</td>
<td>549</td>
<td>278</td>
<td>278</td>
<td>112</td>
<td>0</td>
<td>4123</td>
</tr>
</tbody>
</table>

| DocuNet   | # of requests | 1666 | 827 | 551 | 462 | 1242 | 780 | 666 | 811 | 808 | 808 | 541 | 0 | 9032 | 36.13% |

| E.D.I.    | # of requests made through OUAC | 1278 | 983 | 442 | 296 | 567 | 1333 | 262 | 177 | 298 | 298 | 824 | 0 | 12230 | 26.96% |

| Bourses   | # of requests made internally (by faculties / departments) | 322 | 1026 | 303 | 104 | 696 | 101 | 110 | 97 | 1044 | 1044 | 134 | 0 | 5181 | 20.61% |

| Total relevé de notes envoyées | # of transcripts sent where requests were made by email/fax | 502 | 438 | 267 | 267 | 629 | 292 | 168 | 434 | 118 | 118 | 196 | 0 | 3449 |

| Formulaire | External institutions form that needs to be filled out by UO (e.g. professional orders, REPS, etc.) | 9 | 7 | 8 | 5 | 22 | 104 | 407 | 127 | 15 | 15 | 18 | 0 | 737 |

| Kardex    | # of requests for pre-1074 graduates (microfiche, cartons) | 3 | 1 | 2 | 3 | 2 | 1 | 8 | 2 | 1 | 1 | 3 | 0 | 27 |

| à créer   | # to create | 2 | 1 | 13 | 3 | 5 | 0 | 8 | 2 | 1 | 1 | 3 | 0 | 39 |

| Descriptions de cours | # of requests for one-paragraph descriptions of current and past courses | 0 | 26 | 16 | 75 | 27 | 40 | 0 | 88 | 0 | 0 | 36 | 0 | 300 |

| Syllabus    | # of requests for syllabus of past and current courses (that's a lot of work involved here) | 3 | 7 | 7 | 7 | 0 | 7 | 31 | 7 | 6 | 6 | 124 | 0 | 205 |

| Lettres Attestations | # of requests for proofs of enrollment (email, fax and DocuNet) | 161 | 107 | 112 | 56 | 376 | 165 | 244 | 370 | 133 | 133 | 60 | 0 | 1917 |

| Education Verification | # of requests for proofs of graduation (email, fax and AuraData [external service]) | 96 | 119 | 82 | 119 | 179 | 110 | 119 | 127 | 84 | 84 | 90 | 0 | 1209 |

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25,000 – 26,000 Requests Annually
Only 36% through DocuNet
• Consider the critical factors impacting the process and develop a list of potential solutions to address those factors
• Develop evaluation criteria and select best solutions
• Evaluate solutions for risk
• Optimize solutions
• Develop ‘To-Be’ Process Map(s) and High-Level Implementation Plan
• Develop Pilot Plan & Pilot Solutions
Available tools for the Improve Phase

- Brainstorming
- Benchmarking
- **Solution Selection Matrix**
- Process Improvement Techniques
- Process Balancing
- Process Flow Improvement
- Queuing Theory
- Design of Experiments (DOE)
- Replenishment Pull
- Poka-Yoke
- **FMEA**
- 'To-Be' Process Maps
- Piloting and Simulation
- Response Surface Methodology
- QFD – 3
- Crystal ball Simulation
- Scorecards Gap Analysis
# Admission’s Solution Matrix Prioritized

<table>
<thead>
<tr>
<th>Solution Priority Number</th>
<th>Application Manager (Accountable)</th>
<th>Applicant/Student Cycle Time Decrease</th>
<th>Start Partially/Full</th>
<th>Workload Volume Decline</th>
<th>Key Process Step</th>
<th>Status</th>
<th>Key Process Step Area of Opportunity</th>
<th>Process Step Root Cause</th>
<th>Stakeholder Input to Solution</th>
<th>Solution Overview and estimated resourcing</th>
<th>Date Start</th>
<th>Target Implementation Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.00</td>
<td>CCS &amp; Registrar</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>Correspondence: Mail acknowledgement of application for Common Law and Education</td>
<td>Red</td>
<td>Not have to complete this as a paper transaction</td>
<td>Different rules today for these departments. More complicated so last to be negotiated with to move to electronic only</td>
<td>Takes a lot of time daily and would be of great benefit</td>
<td>Send out acknowledgment letters electronically via Talisma / Key resources: Louis-Phillipe Basque, Chris Bullee, Denise St-Jean, Louise Jubinville. Both Faculties cannot be done in parallel assuming that Education goes first.</td>
<td>TBD</td>
<td>Discussion with Admissions Required to formalise requirements.</td>
</tr>
<tr>
<td>3.6</td>
<td>2.7</td>
<td>1.8</td>
<td>0.9</td>
<td>9</td>
<td>Scanning &amp; Indexing: Automatically Index files to student profile</td>
<td>Red</td>
<td>Student Number is entered twice. Once on the form by the Student and then once during indexing.</td>
<td>Over 46,089 documents for 09 cycle; 1 FTE allocated to this task; Manual process with risk of errors (incorrectly indexed document disappear in the void); Bottleneck in current workflow; Indexing is a non value added step: it’s preparation work for subsequent value added actions.</td>
<td>Solution One: Use the Student Number written on the form to index during scanning. - Cost of $11k (printer and consultant to configure solution). - Added printing cost (10,000 pages x $0.04): $400 yearly - This solution could be implemented by the middle of July 2012 and would not lock up CCS resources.</td>
<td>Solution One: Immediate: student number indexed.</td>
<td>Solution One: July 2012</td>
<td></td>
</tr>
</tbody>
</table>

## Solution Two:
- Outsource reception of mail and indexing of documents.
- Cost estimated to be comparable to 1 FT Indexing Clerk.
- This solution could be implemented by Fall 2012.
IMPROVE phase:
Failure Modes and Effects Analysis (FMEA)

- Severity / Frequency / Detection

- Outcomes

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>What is the process about input under investigation?</td>
<td>In what ways does the Key Input go wrong?</td>
<td>What is the impact on the Key Output Variables (Customer Requirements) or internal requirements?</td>
<td>What causes the Key Input to go wrong?</td>
<td>How often does the failure of the Key Input occur?</td>
<td>What are the existing controls and procedures (inspection and test) that prevent the failure of the Failure Mode?</td>
<td>What are the actions for reducing the occurrence or effect of the Cause, or improving detection?</td>
<td>Who is Responsible for the recommended action?</td>
<td>What are the actions taken with the recalculated RP N (be aware to include completion %)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Process Owner</td>
<td>Admissions does not identify an individual</td>
<td>No one accountable to control for consistency not in place</td>
<td>9</td>
<td>Shortage of resources</td>
<td>9</td>
<td>Process inconsistent today due to each ops manager managing and interpreting differently</td>
<td>9</td>
<td>720</td>
<td>Using Eric to get support for identification at Process Owner</td>
<td>Daniel Trottier</td>
<td>Daniel to work with Sonia and Eric</td>
</tr>
<tr>
<td>Lack of Support From GIT</td>
<td>Admissions does not allocate resources to develop or buy the tool</td>
<td>Return to current state</td>
<td>9</td>
<td>Shortage of resources</td>
<td>3</td>
<td>Tracker is there but would not be the recommended robust solution</td>
<td>9</td>
<td>243</td>
<td>Working with Robert Saver to get development underway. Should this not happen, we will enlist Michel Laporte to support</td>
<td>Daniel Trottier</td>
<td>Met Hélène...have follow up meeting in September</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SEV</th>
<th>OCC</th>
<th>DET</th>
<th>RP N</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3</td>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>3</td>
<td>27</td>
</tr>
</tbody>
</table>
Admission at the Faculty of Education

Potential Solutions

- Acknowledgement of application reception
- Statement of experience (SOE)
- Linguistic competency tests
- Send out an electronic offer of admission
- Stop numbering waiting list: identified as a quick win

Prioritization

- Why SOE?
• Transition project to process owner

• Institutionalize process changes and controls

• Document a control plan

• Measure the results
  – calculate resulting process metrics
  – sustain the gains

• Ongoing monitoring of process performance
CONTROL phase: Measure the results

Requires discipline to implement: when things go right it’s easy to mistakenly skip this part

Admission at the Faculty of Education

• Kept track of the timing of admission requests
• Conducted a postmortem (voice of the client)
• We will be conducting focus groups with the students starting in the Fall
Results

• Reduced student lineups

• Improved student satisfaction: confirmed yet to be measured

• Realignment of staff to more value-added tasks

• Cultural changes

• We are all asking for more...
Lessons learned

• Ensure someone at the Executive level champions the initiative

• Train all staff involved, including clients (common understanding of objectives and “language”)

• Don’t underestimate the time investment required

• Don’t expect instant results

• Politics often trumps policy and planning

• Don’t do it alone; external partners are available

• Get prepared for more...
Workshop segment

• Pairwise comparison exercise
  – Use this tool when you want to compare the importance of various items in regards to one another and identify weights to use in a prioritization matrix
  – Example: Which season do you prefer?

<table>
<thead>
<tr>
<th></th>
<th>A - Spring</th>
<th>B - Summer</th>
<th>C - Fall</th>
<th>D - Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Spring</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>B - Summer</td>
<td>-</td>
<td>-</td>
<td></td>
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<tr>
<td>C - Fall</td>
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<tr>
<td>D - Winter</td>
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</table>
Workshop segment

- Fill-in the Matrix by comparing your preferences

<table>
<thead>
<tr>
<th></th>
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<th>B – Summer</th>
<th>C - Fall</th>
<th>D - Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>A – Spring</td>
<td>-</td>
<td>A</td>
<td>AC</td>
<td>A</td>
</tr>
<tr>
<td>B – Summer</td>
<td>-</td>
<td>-</td>
<td>B</td>
<td>D</td>
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<tr>
<td>C – Fall</td>
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<td>C</td>
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<tr>
<td>D – Winter</td>
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</tbody>
</table>

- Count your preferences: A=3, B=1, C=2 and D=1
- Assign weights: A=3/7=43% B=1/7=14% C=2/7=29% D=1/7=14%
- Conclusion: I prefer Spring over all other seasons!
Looking ahead

- Use of the methodology for the SIS replacement
- Expand the use of the Lean Six Sigma concepts and tools University-wide
Questions

If you would like to reach us, you can do so at:
danielt@uottawa.ca
or
lapmich@uottawa.ca
Lean Six Sigma Road Map

Improvement Process Road Map

**DEFINE**
Activities
- Identify Problem
- Complete Charter
- Develop SIPOC Map
- Gather Voice of the Customer & Voice of the Business
- Develop CCR’s & CBR’s
- Finalize Project Focus

**MEASURE**
Activities
- Identify Key Input, Process and Output Metrics
- Develop Operational Definitions
- Develop Data Collection Plan
- Validate Measurement System
- Collect Baseline Data
- Determine Process Performance/Capability
- Validate Business Opportunity
- Map Business Process
- Map Value Stream

**ANALYZE**
Activities
- Propose Critical X’s
- Prioritize Critical X’s
- Conduct Root Cause Analysis on Critical X’s
- Validate Critical X’s
- Estimate the Impact of Each X on Y
- Quantify the Opportunity
- Prioritize Root Causes

**IMPROVE**
Activities
- Develop Potential Solutions
- Develop Evaluation Criteria & Select Best Solutions
- Evaluate Solution for Risk
- Optimize Solution
- Develop ‘To-Be’ Process Map(s) and High-Level Implementation Plan
- Develop Pilot Plan & Pilot Solution

**CONTROL**
Activities
- Develop SOP’s, Training Plan & Process Control System
- Implement Process Changes and Controls
- Monitor & Stabilize Process
- Transition Project to Process Owner
- Identify Project Replication Opportunities
- Calculate Financial Benefits

Tools
- Pareto Charts
- Project Selection Tools
- Project Management
- Various Financial Analysis
- Charter Form
- Stakeholder Analysis
- Communication Plan
- SIPOC Map
- High-Level Process Map
- VOC and Kano Analysis
- Quality Function Deployment (QFD)
- RACI Charts
- Thought Process Map
- SIPOC Map
- Operational Definitions
- Data Collection Plan
- Statistical Sampling
- Measurement System Analysis (MSA), Gage R&R
- Constraint Identification
- Setup Reduction
- Work Control Systems
- Kaizen
- Control Charts
- Process Capability, Cp & Cpk
- Value Stream Map
- Non-Value-Added Analysis
- QFD -1
- C&E Matrix
- C&E / Fishbone Diagrams
- Brainstorming
- Detailed ‘As-Is’ Process Maps
- Basic Statistical Tools
- Non Value-Added Analysis
- Confidence Intervals
- Hypothesis Testing
- Non-Parametrics
- FMEA
- Box Plots
- Interaction Plots
- Multi-Vari Charts
- Chi-Square Analysis
- Simple & Multiple Regression
- Logistic Regression
- One-way and Two-way ANOVA
- ANOM
- Box-Cox transformation
- QFD-2
- Scorecards
- Excel Analysis Tools

- Brainstorming
- Benchmarking
- Solution Selection Matrix
- Process Improvement Techniques
- Process Balancing
- Process Flow Improvement
- Queuing Theory
- Design of Experiments (DOE)
- Replenishment Pull
- Poka-Yoke
- FMEA
- ‘To-Be’ Process Maps
- Piloting and Simulation
- Response Surface Methodology
- QFD – 3
- Crystal ball Simulation
- Scorecards Gap Analysis

Control Charts
- Standard Operating Procedures (SOP’s)
- Training Plan
- Communication Plan
- Implementation Plan
- Visual Process Control
- Process Control Plans
- Project Commissioning
- Project Replication
- Plan-Do-Check-Act Cycle
- Scorecards
- Dashboard
Example: SIPOC Diagram – Helpdesk Incident Process (simplified)

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Input</th>
<th>Process</th>
<th>Output</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1. Call &amp; incident creation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Prioritize the problem</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Process the incident</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>4. Incident resolution</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>5. Close incident</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Client feedback</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SIPOC Diagram – Helpdesk Incident Process – Answer sheet

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Input</th>
<th>Process</th>
<th>Output</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Student, prof, or staff</td>
<td>• Customer name, address, tel. # • Nature of problem • Equipment specifications</td>
<td>1. Call &amp; incident creation</td>
<td>• Ticket/incident creation</td>
<td>• Helpdesk Analyst</td>
</tr>
<tr>
<td>• Helpdesk Analyst</td>
<td>• Severity of problem • Customer’s title (prof)</td>
<td>2. Prioritize the problem</td>
<td>• Ranking of ticket/incident</td>
<td>• 2nd Level Support Analyst</td>
</tr>
<tr>
<td>• 2nd Level Support Analyst</td>
<td>• Confirmation of data • Equipment knowledge • Analyst’s knowledge • Vendor interaction</td>
<td>3. Process the incident</td>
<td>• Development of solution</td>
<td>• 2nd Level Support Analyst</td>
</tr>
</tbody>
</table>
### SIPOC Diagram – Helpdesk Incident Process – Answer sheet

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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4. Incident resolution</td>
<td>•Deployment of solution</td>
<td>•Student, prof or staff</td>
</tr>
<tr>
<td>•2nd Level Support Analyst •Vendor</td>
<td>•Analyst’s action plan •Vendor input •Confirmation solution works</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Close incident</td>
<td>•Solutions database addition</td>
<td>•Helpdesk Analyst</td>
</tr>
<tr>
<td>•2nd Level Support Analyst</td>
<td>•Documentation of solution •Vendor input</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>•Student, prof, or staff</td>
<td>•Feedback</td>
<td>6. Client feedback</td>
<td>•Ticket/incident satisfaction ranking</td>
<td>•Management</td>
</tr>
</tbody>
</table>
Cause & Effect (Fishbone) Analysis

Major categories typically are:

- 6 M’s: Methods, Machines, Materials, Manpower, Measurement, Management
- 4 P’s: Place, Procedure, People, Policies
- 4 S’s: Surroundings, Suppliers, Systems, Skills