Applying the Six Sigma Methodology to Improve the Admissions & Financial Aid Processes, Perceptions and Accountability
Presentation Agenda

- UMR Overview and Student Market Trends
- Problem Statement & Premise of the Research
- Review of the Literature
- Methodology and Research Format
- Applying Six Sigma at the UMR Admissions Office --
  Results & Analysis
  - Measure
  - Analyze
  - Improve
  - Control
- Conclusions
- Suggestions for Future Work
- Questions & Discussion
University of Missouri – Rolla
A Technological Research University

• 5600 Students: 75% Undergrad, 25% Graduate
• 76% Engineering Majors, 93% STEM Majors
• Average Scores: 27.4 ACT, 1280 SAT
• 75% In-state, 25% Out-of-state
• $37 million in Sponsored Research
• 13:1 Student Faculty Ratio
## UMR Enrollment Trends 2000-2005

### Fall 2005 Total Enrollment:

5,602

<table>
<thead>
<tr>
<th>Enrollment (4th week after classes begin)</th>
<th>FS 2000</th>
<th>FS 2005</th>
<th>FS 2000 - 2005 (5 yr)</th>
<th>FS 2005 % of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Undergraduate Students:</strong></td>
<td></td>
<td></td>
<td>Change</td>
<td>% Change</td>
</tr>
<tr>
<td>Freshmen</td>
<td>811</td>
<td>1,122</td>
<td>311</td>
<td>38%</td>
</tr>
<tr>
<td>Sophomores</td>
<td>688</td>
<td>881</td>
<td>193</td>
<td>28%</td>
</tr>
<tr>
<td>Juniors</td>
<td>755</td>
<td>961</td>
<td>206</td>
<td>27%</td>
</tr>
<tr>
<td>Seniors</td>
<td>1,444</td>
<td>1,349</td>
<td>-95</td>
<td>-7%</td>
</tr>
<tr>
<td>Total Undergraduates</td>
<td>3,698</td>
<td>4,313</td>
<td>615</td>
<td>17%</td>
</tr>
<tr>
<td><strong>Graduate Students:</strong></td>
<td></td>
<td></td>
<td>% Change</td>
<td>% of Total</td>
</tr>
<tr>
<td>Graduate Certificates</td>
<td></td>
<td></td>
<td></td>
<td>2%</td>
</tr>
<tr>
<td>Masters</td>
<td>647</td>
<td>789</td>
<td>142</td>
<td>22%</td>
</tr>
<tr>
<td>Doctoral</td>
<td>281</td>
<td>369</td>
<td>88</td>
<td>31%</td>
</tr>
<tr>
<td>Total Graduate Students</td>
<td>928</td>
<td>1,289</td>
<td>361</td>
<td>39%</td>
</tr>
</tbody>
</table>
Diversity Increases

Total On-Campus Enrollment: Under-represented minorities (Undergraduate and Graduate)
University of Missouri - Rolla
Geographic Origin of All Students - Fall 2005

Note: Geographic Origin is defined as student’s legal residence at time of original admission to UMR.
Source: Integrated Postsecondary Education Data System (IPEDS) frozen files, end of 4th week of classes.
University of Missouri - Rolla
Geographic Origin of All Students – Preliminary Fall 2005

Legend
- 50 or more students
- 10 – 49 students
- 1 - 9 students
- No students

Note: Geographic Origin is defined as student's legal residence at time of original admission to UMR.
Source: Integrated Postsecondary Education Data System (IPEDS) frozen files, end of 4th week of classes.
Financial Impact of Enrollment & Retention Growth

• Stronger Understanding of the Relationship between Early Applicant Financial Needs vs. Later Applicants
• Discount Rate lowered 14%
• + $11 Million in tuition revenue

• 1st - 2nd Retention Rate: 87% +4%
• Graduation Rate: 64% +12%
A New Demand for Top Quality Service at Midwest Colleges

- Decline in traditional Midwest undergraduates 2009-2015.
- Continuing Shrinking of STEM Majors: Addressing the K-12 student interests not matching societal and industry needs.
- Due to the downward traditional student market, schools must focus on stronger undergraduate student retention and emphasize graduate enrollments.
- Strong Transfer Programs Needed: due to increasing costs, more students are starting at community colleges.
- Successful recruitment requires a multi-media approach that embraces needs of high-tech, high-touch and highly diverse generation.
Projected Change in High School Graduates 2002-2012

The Midwest and Northeast are projected to peak in 2007-08. While the West, like the nation, is expected to see its peak year for graduates in 2008-09, the South will see its high point in 2009-10 (and again later in the projection period).

Map: STAMATS, 2005

Missouri Public High School Graduates

1987-88 to 2001-02 (actual)
2002-03 to 2017-18 (projected)

SOURCE: WICHE 2004
Decreases in Engineering Students

Potential Engineering Majors
All College Bound, ACT Tested Students Interested in Any Engineering Field

Number


63653 66475 67764 64571 64937 63329 63601 65329 65776 61648 54175 52112 51445 48438
## New Student Market Share

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2002</th>
<th>2004</th>
<th>GAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public High School Graduates*</td>
<td>52,852</td>
<td>54,513</td>
<td>57,573</td>
<td>8.9%</td>
</tr>
<tr>
<td>UM Campus Freshmen</td>
<td>6,233</td>
<td>6,533</td>
<td>6,880</td>
<td>10.4%</td>
</tr>
<tr>
<td>Other Freshmen 4 year public</td>
<td>10,937</td>
<td>10,762</td>
<td>11,190</td>
<td>2.3%</td>
</tr>
<tr>
<td>Freshmen 4 year Private</td>
<td>8,729</td>
<td>8,695</td>
<td>9,094</td>
<td>4.2%</td>
</tr>
<tr>
<td>TOTAL 2 year Public</td>
<td>25,899</td>
<td>25,990</td>
<td>27,164</td>
<td>4.9%</td>
</tr>
<tr>
<td>% of 4 yr Freshmen at UM</td>
<td>24.1%</td>
<td>25.1%</td>
<td>25.3%</td>
<td></td>
</tr>
<tr>
<td>% of 4 yr Public Freshmen at UM</td>
<td>36.3%</td>
<td>37.8%</td>
<td>38.1%</td>
<td></td>
</tr>
</tbody>
</table>

**Freshmen 2 year Public**

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2002</th>
<th>2004</th>
<th>GAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshmen 2 year Private</td>
<td>219</td>
<td>238</td>
<td>197</td>
<td>-10.0%</td>
</tr>
<tr>
<td>Total College Freshmen in MO</td>
<td>38,800</td>
<td>41,135</td>
<td>42,690</td>
<td>10.0%</td>
</tr>
<tr>
<td>% of Freshmen at UM</td>
<td>16.1%</td>
<td>15.9%</td>
<td>16.1%</td>
<td></td>
</tr>
</tbody>
</table>

*SOURCES: MO DESE, Annual Report of School Data, web posted Sept. 27, 2004
MO DHE 2004-05 Statistical Summary of Missouri Higher Education; Tables 45, 46
Problem Statement

Can the Six Sigma Methodology be Used to Improve the Processes and Services in an Academic Environment?
Premise of the Research

• Six Sigma has been successful in improving both manufacturing and non-manufacturing processes in industry.

• Previous quality initiatives have been used to make improvements in an academic environment.

• Six Sigma can be successfully applied in an academic setting.
  – But some things may be different.
  – Some tools may be more helpful than others.
  – Factors for success may be different.
Quality in Non-Manufacturing Settings

• Quality initiatives (both TQM and Six Sigma) have evolved to include non-manufacturing and service processes

• Six Sigma has been the primary quality initiative of the last decade with documented successful application improving non-manufacturing processes

• Previous research in the literature indicates large potential benefits (financial and otherwise) can be recognized by improving service, administrative, and other non-manufacturing processes
Quality in Non-Manufacturing Settings

• GE quotes 2X return in non-manufacturing Six Sigma projects compared to manufacturing projects

• Juran Center for Leadership in Quality: “The most startling opportunities we’ve seen are in service and/or administrative areas.”

• Research shows that the cost of poor quality in service-based businesses is typically as high as 50% of total budget (compared to 10-20% for manufacturing operations)

• Initial performance for administrative processes starts between 1.5 and 3 sigma (50-90% yields)

• A 1990 survey says 90% of more of the potential for improvement lies within service industries and service jobs in manufacturing industries.
Quality Initiatives in Higher Education

• Since the late 1980’s there have been many documented quality initiatives in Higher Education

• Most are based on TQM or similar philosophies

• Biggest successes have been in business and administrative processes

No literature examples of a university using the Six Sigma methodology could be found.
Success Factors for Six Sigma

The Right Project
The Right People
The Right Roadmap & Tools
The Right Support

Additional sources in the literature support the 4 “Rights”
Methodology and Research Format

- Case-study research format
- 7 member project team worked to improve the business processes at the UMR Admissions office
- The team used the Six Sigma roadmap and tools:
  
  ___ **MEASURE**
  Process Mapping
  Cause and Effects Matrix
  Measurement System Analysis
  Benchmarking
  Baseline Capability

  ___ **ANALYZE**
  Failure Modes and Effects Analysis
  Multiple-Variable Statistical Analysis

  ___ **IMPROVE**

  ___ **CONTROL**
Project Team & Schedule

Project Team:

Kimberly McAdams - Master’s Student & Team Leader (Black Belt)
Jay Goff - Dean of Enrollment Management
Jennifer Bayless - Assistant Director for Admissions
Lynn Stichnote - Director of Admissions
Laura Stoll - Registrar
Bob Whites - Assistant Director of Financial Aid
Dr. Dave Spurlock - Faculty advisor, Dept of Engineering Management
Dr. Gary Gadbury - Faculty committee, Dept of Math & Statistics
Dr. Steve Raper - Faculty committee, Dept of Engr Management

Schedule:

Measurement: 9/4 - 10/31/01
Analysis: 11/1 - 12/31/01
Improvement: 1/1 - 2/28/02
Control: 3/1 - 5/31/02
The goal is to reduce the variation of the process
If you are at Six Sigma:
You are producing good “product” 99.999% of the time
There are no more than 3.4 defects per 1 million “units”

The word “Sigma” is a statistical term that measures how far a given process deviates from perfection.
GE: “Globalization and instant access to information, products and services have changed the way our customers conduct business — old business models no longer work. Today’s competitive environment leaves no room for error. We must delight our customers and relentlessly look for new ways to exceed their expectations. This is why Six Sigma Quality has become a part of our culture.”
Six Sigma - What it Is

Six Sigma is a defined methodology and a set of statistical and quality tools used to improve the performance of a process so that the organization can realize financial benefits.

GE: “Six Sigma is a highly disciplined process that helps us focus on developing and delivering near-perfect products and services. The central idea behind Six Sigma is that if you can measure how many "defects" you have in a process, you can systematically figure out how to eliminate them and get as close to "zero defects" as possible. Six Sigma has changed the DNA of GE—it is now the way we work—in everything we do and in every product we design.
Applying Six Sigma at the UMR Admissions Office

Results & Analysis
Measure Phase

- Project Definition
- Process Mapping
- Measurement System Analysis
- Cause and Effects Matrix
- Benchmarking
- Baseline Capability
Increase the **efficiency** and **accuracy** of the student inquiry and application process for UMR admissions
Project Benefits

- Increased satisfaction with inquiries and applicants
- Increased enrollment yield of students that apply
- Improved perception, integrity, and accountability of office
- Simpler and better defined process for university employees and students
- More student-friendly customer service
- Improved employee satisfaction resulting in less turnover
- Quicker and more accurate view of status of applications
- Continued adherence to national & state guidelines and good practices
High-Level Process Map

INPUTS
- Media/method of communication
  - internet/web form
  - email
  - mail (card or letter)
  - hand-carry
  - telephone
  - college fair
  - campus visit
  - other campus contact
- Type of document received
  - inquiry - general
  - inquiry - specific
  - application
  - test scores
  - transcript
  - fee
  - financial statement
  - health forms
  - housing info
  - other support papers
- Person processing
- Degree programs
- Season / time of year

OUTPUTS
- Response to student (email, letter, call, postcard)
- Material to student
  (acknowledge, missing, acceptance, brochures…)
- # of applications processed/day/ person
- Time to respond (< 48 hours)
- Operating cost per enrolled student
- # of out files
- # of lost files
- # of customer complaints
- # of reprocessed documents
- # of edit report errors / week

DEFINE OVERALL PROCESS & KEY OUTPUTS
The team defined the metrics that would be used to track performance of the admissions process.
We mapped the flow of the files, documents, and information.

- We found “gaps” or undefined steps.
- We found repetitive or “non-value added” steps.
- Many benefits are often found in mapping a non-manufacturing process.
<table>
<thead>
<tr>
<th>University of Missouri-Rolla (UMR)</th>
<th>Date visited</th>
<th>Types of students</th>
<th># of apps per year</th>
<th>People Soft</th>
<th>How Filed</th>
<th>File Folders</th>
<th>Division of work</th>
<th>Where files end up</th>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Freshman Transfer Graduate International</td>
<td>~6,000</td>
<td></td>
<td>xfer / fresh / grad; by term; all misc in separate file</td>
<td>colored folders by term; use out cards</td>
<td>ungrad / grad; S.A.’s file and support work</td>
<td>send to registrar</td>
<td>computer system tracks location of file; division of labor by alpha; bins for in/out &amp; tbfiled</td>
</tr>
<tr>
<td>Saint Louis University (SLU)</td>
<td>9/21</td>
<td>Freshman Transfer International</td>
<td>~6,000</td>
<td>no</td>
<td>xfer / fresh; 4 alpha sections w/in fresh; current/future/last term; misc under each section</td>
<td>pre-printed file envelope (open only on top); no color coding; use out cards</td>
<td>1 person for xfer &amp; intl; 4 people by alpha for freshman</td>
<td>send to SLU101; filed at department</td>
<td></td>
</tr>
<tr>
<td>University of Missouri-Saint Louis (UMSL)</td>
<td>9/21</td>
<td>Freshman Transfer Graduate International</td>
<td>~15,000</td>
<td>no</td>
<td>all files A to Z</td>
<td>colored folder by 3rd letter of last name</td>
<td></td>
<td>keep final folder</td>
<td></td>
</tr>
<tr>
<td>University of Missouri-Kansas City (UMKC)</td>
<td>9/28</td>
<td>Freshman Transfer Graduate</td>
<td>~15,000</td>
<td>no</td>
<td>all files A to Z; divided into 3 alpha sections; all misc in rolling file</td>
<td>printed colored label to 3rd letter of last name; colored label for year &amp; term; no out cards</td>
<td>1 person enters all apps; 2 people (divided by alpha) enter transcripts, scores &amp; complete file</td>
<td>send to registrar; &quot;did not enroll&quot; also sent to registrars</td>
<td>TRAX barcode system; clearly marked bins on each desk &amp; at each filing/mail station; only copies sent from admissions; focus on &quot;staff development&quot; and motivation</td>
</tr>
<tr>
<td>Kansas University (KU)</td>
<td>9/28</td>
<td>Freshman Transfer</td>
<td>~15,000</td>
<td></td>
<td>incomplete / complete / last term; then all A to Z; misc in separate file</td>
<td>colored label to 3rd letter of last name; colored folders; use full size out cards</td>
<td>ATS opens mail, marks &amp; sorts; seasonal workers for Ap Prep; 4 office specialists &amp; 2 mail processors by alpha division of work</td>
<td>keep final folder</td>
<td>clearly defined division of labor; each document marked w/ name, dated, and checked on system; clearly marked file locations</td>
</tr>
</tbody>
</table>
Baseline Capability - File Processing

Proportion of files “out” of the file room each semester at the Registrar’s “pull”

Total 14.6% of all files were “out” equating to a 2.6 Sigma process
Baseline Capability - Data-Entry Quality

Weekly PeopleSoft™ Edit Report errors for Applications & Inquiries

U is average errors per application/inquiry card

Process is “Out of Control”
Analyze Phase

Failure Modes & Effects Analysis
Multiple Variable (Multi-vari) Analysis
# Multi-Vari Analysis - File Processing

<table>
<thead>
<tr>
<th>Type of Student</th>
<th>Out</th>
<th>In</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>196</td>
<td>1265</td>
<td>1461</td>
</tr>
<tr>
<td>Transfer</td>
<td>174</td>
<td>574</td>
<td>748</td>
</tr>
<tr>
<td>Graduate</td>
<td>61</td>
<td>675</td>
<td>736</td>
</tr>
</tbody>
</table>

Chi-Sq = 70.032, P-Value = 0.000

Chi-Square Test of Files “Out” by Type of Student

- Chi-square test for Files “out” by Type of Student
- Ho: “Out” files does not depend on Type of Student
- Reject the null hypothesis -- there IS a significant difference
- Significantly MORE files “out” for Transfer students than would be expected
### Multi-Vari Analysis - File Processing

<table>
<thead>
<tr>
<th>Type of Student</th>
<th>Out</th>
<th>In</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Winter</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>actual</td>
<td>70</td>
<td>758</td>
<td>828</td>
</tr>
<tr>
<td>expected</td>
<td>88</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td><strong>Summer</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>actual</td>
<td>39</td>
<td>217</td>
<td>256</td>
</tr>
<tr>
<td>expected</td>
<td>27</td>
<td>229</td>
<td></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>actual</td>
<td>324</td>
<td>2664</td>
<td>2988</td>
</tr>
<tr>
<td>expected</td>
<td>318</td>
<td>2670</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>433</td>
<td>3639</td>
<td>4072</td>
</tr>
</tbody>
</table>

Chi-Sq = 9.980, P-Value = 0.007

Chi-Square Test of Files “Out” by Term

- Chi-square test for Files “out” by Term
- Ho: “Out” files does not depend on Term
- Reject the null hypothesis -- there IS a significant difference
- Significantly MORE files “out” in the Summer & Fall than would be expected
Multi-Vari Analysis - File Processing

Files "Out"

- TOTAL ACCOUNTED FOR (in Parker Hall)
- REMAINING "OUT" (in Departments)

Weekly number of Files “Out”

AVERAGE FILES CHECKED OUT
1/18/02 - 4/26/02

Pareto of the average Files “Out” by Person

Tracking the # of files out each week and where they were located
Multi-Vari Analysis - Data-Entry Quality

Pareto of Manual Errors by Type

Pareto of Edit Report Errors by Type

Tracking number and type of errors found each week
# Multi-Vari Analysis - Data-Entry Quality

<table>
<thead>
<tr>
<th>Type of Data-Entry</th>
<th>Errors</th>
<th>Fields</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>actual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applications</td>
<td>195</td>
<td>22804</td>
<td>22999</td>
</tr>
<tr>
<td></td>
<td>expected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prospect Cards</td>
<td>402</td>
<td>36409</td>
<td>36811</td>
</tr>
<tr>
<td></td>
<td>367</td>
<td>36444</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>597</td>
<td>59213</td>
<td>59810</td>
</tr>
</tbody>
</table>

\[ \text{Chi-Sq} = 8.542, \quad \text{P-Value} = 0.003 \]

Chi-Square Test of Errors by Type

- Chi-square test for Errors by Type of Data Input
- Ho: Errors do not depend on Type of Data Input
- Reject the null hypothesis -- there IS a significant difference
- Significantly MORE errors inputting Prospect Cards
- Need to inform & better train student employees
Modified FMEA for Edit Report Errors summing:

- **Frequency** that the error occurs
- **Severity** of the impact if the error occurs

**Conclusion:** Need to focus on Residency
Multi-Vari Analysis - Processing Efficiency

Boxplots of Min/File by Student
(means are indicated by solid circles)

Analysis of Variance for Min/File

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>2</td>
<td>398.0</td>
<td>199.0</td>
<td>18.57</td>
<td>0.000</td>
</tr>
<tr>
<td>Error</td>
<td>21</td>
<td>225.0</td>
<td>10.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>623.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- ANOVA for Time to Copy by Student
- Ho: $\mu_1 = \mu_2 = \mu_3$ (mean time to copy is independent of student)
- Reject the null hypothesis -- there IS a significant difference
- Different workers (mostly students) took significantly more time to copy documents
- Conclusion: Need consistent training for ALL workers
Improve Phase

Experiments
Process Changes
Mistake-Proofing Methods
Initial Improvement Proposal

1-Filing Proposal
2-Division of Office Work Activities
3-Office Organization
4-Office Personnel Development
5-File Management Guidelines

Initial changes based on benchmarking and process mapping
File everything A to Z

Color-coded labels for 1st three letters of student’s last name

Color-coded label for year

All folders the same color

(1) Filing Proposal
(2) Division of Work Activities

- Division of activities first split by graduate & undergraduate
- Then an alphabet split among 4.5 data entry specialists

  example:
  Graduate      Undergraduate
  (A-D) - Sharlene 1/2  (A-M) - Carolyn
  (E-S) - Marsha      (N-Z) - Rana
  (T-Z) - Connie

- All application-related work for each student is processed by the same data entry specialist
  - Applications
  - Test Scores
  - Transcripts
  - Letters and financial statements
  - Specific phone calls & emails

Benefits

- Specialist becomes familiar with student (especially helpful with problems & questions)
- Specialist has ownership of student’s file and documents
- Students and people outside office know who to go to with a question about a student’s file
- Each specialist does all aspects of job
  - automatic cross-training
  - reduces repetition
- More balanced division of work
- Better loading of seasonal work
(3) Office Organization Suggestions

- **Office organization of mail and files**
  - Bins for file room for “To be filed”
  - Bin for “Needs label”
  - Signs for data entry specialists with names and work responsibility
  - Signs for all bins and work areas
  - Mail sorter for incoming mail – 5 alpha divisions

- **Desk organization of files**
  - Marcia, Julie S., and Jennie
    - Clear “inbox”, “in-process”, “to be filed”
  - Data Entry Specialists
    - Clear “inbox”, “in-process”, “labels”, “completes”, and “to be filed”

(4) Office Development

- **Student focus**
- **Positive Attitude**
- **Motivation Tools**
- **Morale Boosters**
- **Continued Training**
- **Best-practices**

- **Posters**, **signs**, **office meetings**, **lunch-n-learns**, **“stars”**, **“Organization Development”**, **“Assistant Director of Customer Service”**
(5) File Management Guidelines

- No misplaced files!!
- No misplaced documents
- Fewer files out of file room for less time
- Take immediate / timely action on file
- Use and update “out cards” --> color card & date
- All files returned to file room each week
- Weekly count of “out” files and follow-up action
- Original documents stay within Parker Hall
- Documented and clearly communicated file management process and system
- Continuous improvement meetings
- Work towards a paperless system
Other Improvements

• Process Change so that *No Original Documents* leave Parker Hall

• Other *Process Modifications* to elimination steps and simplify the process flow

• *Data-entry Quality Improvements*
  
  • Immediate Feedback & Awareness of Errors
  
  • Permanent PeopleSoft™ software changes

• *Workspace Redesigned*
  
  • Space coordinated according to work processes
  
  • Better desk space and file coordination
  
  • Organized to accommodate imaging system
Workspace Redesign Improvements
Workspace Redesign Improvements

TRANSFER & GRADUATE ADMISSIONS OFFICE
Measured Improvements for Errors
Temporary Action: Spot Checking Files

- Can not claim any measured improvements here due to the fact that we did not start tracking data until January 2002, which was over 4 months into the project.
- Long term look for “Mistake Proofing” fixes: software modifications were made to limited data entry options (i.e. pull down menus, zip coding checking by city/state abbreviation) and daily automated data edit checks were installed.
• There has been a significant change in the number of files out of the file room.
• 13 out of 1,320 files were not found for the Fall 2002 semester.
# Measured Improvements

<table>
<thead>
<tr>
<th>TERMS</th>
<th>Out</th>
<th>In</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>W2000 - F2001</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>actual</td>
<td>431</td>
<td>3738</td>
<td>4169</td>
</tr>
<tr>
<td>expected</td>
<td>323</td>
<td>3846</td>
<td></td>
</tr>
<tr>
<td><strong>W2002 &amp; F2002</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>actual</td>
<td>15</td>
<td>1566</td>
<td>1581</td>
</tr>
<tr>
<td>expected</td>
<td>123</td>
<td>1458</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>446</td>
<td>5304</td>
<td>5750</td>
</tr>
</tbody>
</table>

There has been a significant change in the number of files out of the file room.

## Test and CI for Two Proportions

<table>
<thead>
<tr>
<th>Sample</th>
<th>X</th>
<th>N</th>
<th>Sample p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3738</td>
<td>4169</td>
<td>0.896618</td>
</tr>
<tr>
<td>2</td>
<td>1566</td>
<td>1581</td>
<td>0.990512</td>
</tr>
</tbody>
</table>

Estimate for p(1) - p(2): -0.0938944

95% CI for p(1) - p(2): (-0.104299, -0.0834903)

Test for p(1) - p(2) = 0 (vs not = 0): Z = -17.69  P-Value = 0.000
Measured Improvements

Congratulations!
100% Files for PRO
File Room
Nailed it!
Faster Admission Processing

• Achieved goal of 48 hour First Review of Apps
  – Undergraduate Apps Completed 17% Faster than in 2000
  – Graduate Apps Completed 24% Faster than in 2000
Control Phase

Hand-off
Processing Monitoring
Reaction Plan
Control – Implementing the Changes

• Hand-off to process owner, Assistant Director for Admissions

• Some of the effort is complete; much needs to be maintained

• Enrollment Management team to review metrics monthly
  • File Processing metrics
  • Data-entry Quality metrics

• Data-Entry specialists to meet once a month
  • Review File Processing metrics
  • Review Data-entry Quality metrics
  • Discuss Process Issues, Changes, & Improvements

• Keep Process Maps Updated
Analysis of Success Factors

- The Right Project
- The Right People
- The Right Roadmap & Tools
- The Right Support

• Overall, the team met the 4 factors for success
• Some notes:
  • The project scope was large
  • The team needed early representation from the process operators
  • C&E Matrix & FMEA would have helped to narrow the scope
Key Conclusions

• The Six Sigma team improved the accuracy, reliability and efficiency of the student application evaluation and data processing in the UMR admissions office

• In general, the application of the Six Sigma methodology in this academic setting was no different than would be seen in industry

• Some tools were more useful than others
  • Defined meaningful metrics and goals
  • Process Mapping & Benchmarking were foundation
  • C&E Matrix and FMEA should have been better applied
  • Data analysis directed team as to where to focus effort

• Six Sigma was a useful framework for the improvement efforts
Suggestions for Future Work

• Additional Six Sigma work at the Enrollment Management Office
  • Time for Admissions office to respond to students
  • On-line application
  • Registrars
  • Financial Aid
  • Voice of the customer to insure the goals of the office align with the needs and wishes of both students and the university

• Other Potential Areas to Apply Six Sigma at UMR

<table>
<thead>
<tr>
<th>Purchasing</th>
<th>Food service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial aid service</td>
<td>Facilities management</td>
</tr>
<tr>
<td>Marketing &amp; Promotions</td>
<td>Faculty &amp; staff hiring</td>
</tr>
<tr>
<td>Travel</td>
<td>Student housing</td>
</tr>
<tr>
<td>Grant application</td>
<td>Accounting &amp; payroll</td>
</tr>
<tr>
<td>Enrollment and registration</td>
<td>Classroom evaluation</td>
</tr>
<tr>
<td>Printing/copying/mail services</td>
<td>Library services</td>
</tr>
</tbody>
</table>
Follow-up to Study

• Data Points have not been regularly reviewed and discussed with management and the data entry team.

• 6 Sigma updates need to be built into the agenda of every monthly team meeting.

• Progress Charts need to be posted in the office
Summary

This research has demonstrated that the Six Sigma methodology, which has been so effective in industry, can be successfully applied to improve the business processes in an academic setting.

Although the UMR Admissions unit experienced immediate and consistent improvements, the monitoring and active review of the data points must be regularly reviewed and discussed on a bi-weekly basis.
Questions?

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