FMEA Saves Business From Shutdown
A Case Study

Rai Chowdhary
M. S., CQE, CQM
rai_chowdhary@yahoo.com
www.hownwhy.com

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Topics Covered

• The Business Case
• Current State
• Future State
• Enablers and Sustainers
• Identifying Potential Failures
• FMEA – High Level
• FMEA – Cascading
• Results
• Concluding Remarks
### The Business Case

<table>
<thead>
<tr>
<th>Type of Business:</th>
<th>Services – Training, Consulting, Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeframe:</td>
<td>1999 (Company founded 1993)</td>
</tr>
<tr>
<td>Mission:</td>
<td>Enable our customers to succeed thru integrated application of knowledge based solutions</td>
</tr>
<tr>
<td>New Developments:</td>
<td>Training center being setup, significant borrowing and business risk lay ahead</td>
</tr>
</tbody>
</table>
Key Observations:

- 90% of business generated from 2 of 8 clients
- Both clients in technology areas
- 100% business from corporate clients
- Clients use multiple vendors, our company is one of them
- Little scope for branding
- Locked into narrow range of classes
  
  ...

  ...
Future State - 2003

Based on Strategic Business Plan:

1. 20 + corporate clients
2. <= 10% of total revenues from any one client
3. >= 30% revenues from branded products / services
4. 2003 revenues to be > 3X those for 2000
5. Diversify over 10+ different sectors / industry groups
6. <= 15% dependence on any one sector / group
Enablers / Sustainers

From The Tactical Team’s Recommendations:

• Develop 100 + proprietary home grown workshops
• Build / setup training center
• Develop Internet and non Internet based marketing plans
• Build adequate cash reserves – to survive down turns
• Generate cash flow to fund growth
• …
• …
• …
Identifying Potential Failures

Based on Tactical Team’s Recommendations:

- Inadequate number or mix of proprietary workshops
- Delays / other problems with training center
- Marketing plans not developed or inadequate
- Insufficient cash reserves – to survive down turns
- Low cash flows – incapable of funding growth
- …
- …
- …

Each one of these is a failure mode!
# FMEA – High Level

## Prioritizing Failure Modes for Drill Down:

<table>
<thead>
<tr>
<th>Potential Failure Mode</th>
<th>Potential Effect</th>
<th>Sev</th>
<th>Potential Causes</th>
<th>Occ</th>
<th>Current Controls</th>
<th>D</th>
<th>RPN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate no. or mix of workshops</td>
<td>Impacts revenues from branded products and services</td>
<td>4</td>
<td>Lack of direction / definition on topics</td>
<td>2</td>
<td>Market surveys</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>Delays / problems with trg. Center</td>
<td>Impacts revenues from branded products and services</td>
<td>4</td>
<td>No Project Manager assigned</td>
<td>5</td>
<td>None</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>Marketing plans not developed or inadequate</td>
<td>Missed goal of 20+ corporate clients</td>
<td>5</td>
<td>Marketing team mis directed</td>
<td>3</td>
<td>Plan reviews</td>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>Insufficient cash reserves to survive down turns</td>
<td>Out of business??</td>
<td>5</td>
<td>Cash flow analysis not current</td>
<td>2</td>
<td>Quarterly cash flow analysis</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Delayed payments from customers</td>
<td>3</td>
<td>None</td>
<td>5</td>
<td>75</td>
</tr>
<tr>
<td>Low cash flow - cannot fund future growth</td>
<td>Impacts revenues from branded products and services</td>
<td>4</td>
<td>Cash flow analysis not current</td>
<td>2</td>
<td>Quarterly cash flow analysis</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Delayed payments from customers</td>
<td>3</td>
<td>None</td>
<td>5</td>
<td>60</td>
</tr>
</tbody>
</table>
Prioritizing Failure Modes for Drill Down:

- Six failure modes stood out as needing immediate attention and these were investigated further.

- Each was entrusted to a separate team, that conducted further detailed FMEAs to ascertain causes that could be acted upon.

6 FMEAs created from one High Level FMEA.
# FMEA – Cascading

## Potential Failures – Training Center:

<table>
<thead>
<tr>
<th>Potential Failure Mode</th>
<th>Potential Effect</th>
<th>Sev</th>
<th>Potential Causes</th>
<th>Occ</th>
<th>Current Controls</th>
<th>D</th>
<th>RPN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non compliance with code</td>
<td>City shuts down on audit after operations</td>
<td>5</td>
<td>Occupancy vs facilities</td>
<td>4</td>
<td>Floor plans appd for office use</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>Injury to participants</td>
<td>Law suit??</td>
<td>4</td>
<td>Tripping hazards</td>
<td>4</td>
<td>Instructions to builder on flush mounting of floor outlets</td>
<td>4</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Corners / edges are sharp</td>
<td>3</td>
<td>Instructions to builder on rounding of corners / edges</td>
<td>4</td>
<td>48</td>
</tr>
<tr>
<td>Parking difficulties</td>
<td>Customer dis satisfaction</td>
<td>4</td>
<td>Parking lots full</td>
<td>4</td>
<td>None</td>
<td>5</td>
<td>80</td>
</tr>
<tr>
<td>HVAC inadequate</td>
<td>Customer dis comfort</td>
<td>4</td>
<td>Excessive thermal load from computer equipment</td>
<td>3</td>
<td>Consultant studying capacity vs likely load</td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td>Nature caused catastrophe Tornadoes, / storms, etc.</td>
<td>Excessive damage, possible injury / fatality</td>
<td>5</td>
<td>No warning systems installed</td>
<td>3</td>
<td>None</td>
<td>5</td>
<td>75</td>
</tr>
</tbody>
</table>
### FMEA – Cascading

## Potential Failures (Training Center) vs Reality:

<table>
<thead>
<tr>
<th>Focus / Subject of Analysis:</th>
<th>Delays / problems with trg. Center</th>
<th>Reality Check</th>
<th>Implemented Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non compliance with code</strong></td>
<td>Number of restrooms in building was out of compliance. Design was for office use, builder did not know training center needs were different by city code.</td>
<td>Problem was detected and fixed before prints were finalized! Number of restrooms increased from 1 to 3, and converted to unisex</td>
<td><strong>Implemented Corrective Action</strong></td>
</tr>
<tr>
<td><strong>Injury to participants</strong></td>
<td>Over 70% of the floor outlets were high profile, this could not be detected until the end, because of scheduling issues between various contractors involved</td>
<td>Re-work by contractor to fix high profile outlets</td>
<td><strong>Re-work by contractor to fix high profile outlets</strong></td>
</tr>
<tr>
<td><strong>Parking difficulties</strong></td>
<td>Number of spaces available to park was 17, training center capacity was 35.</td>
<td>Negotiated with church in the neighborhood for rights of use of their parking lot during business hours on week days. All communications carry / indicate parking location</td>
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</tr>
<tr>
<td><strong>Nature caused catastrophe Tornadoes, / storms, etc.</strong></td>
<td>Round Rock is susceptible to have tornadoes / storms</td>
<td>Weather warning radio installed</td>
<td><strong>Weather warning radio installed</strong></td>
</tr>
</tbody>
</table>
Sample Results

Non Compliance With City Code:

Additional restrooms installed to bring in compliance
Sample Results

Parking Difficulties:

Parking arrangement with Grace Lutheran Church
Concluding Remarks

- FMEA has proven to be a powerful tool to surface problems that can have severe consequences.

- The following failure modes were prevented from impacting this business:

  1. Injuries to participants from tripping hazards
  2. Shut down / very expensive re-modeling owing to non-compliance with city code
  3. Loss of business from dissatisfied customers owing to parking issues
  4. Cash flow problems from delayed payments because of dysfunctional Accounts Payable department with one of the major clients
Concluding Remarks

• Used in a pro active mode, it can and does enable prevention of severe failures – inspite of the fact that lack of data can cause ratings to be done on a somewhat subjective basis

• It can and ought to be used more often for applications outside of engineering / manufacturing

• Cascading FMEAs enable accurate drill downs to identify treatable causes
Concluding Remarks

A natural lake near the training center makes for a perfect location for outdoor exercises / events!