

FMEA Saves Business From Shutdown

A Case Study

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2001 Quality and Productivity Research Conference

Austin, Texas

May 22-25 2001

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

Type of Business: Services – Training, Consulting, Software

Timeframe: 1999 (Company founded 1993)

Mission: Enable our customers to succeed thru integrated application of knowledge based solutions

New Developments: Training center being setup, significant borrowing and business risk lay ahead

Current State – Q3 1999

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:

- 20 + corporate clients
- $\leq 10\%$ of total revenues from any one client
- $\geq 30\%$ revenues from branded products / services
- 2003 revenues to be $>3X$ those for 2000
- Diversify over 10+ different sectors / industry groups
- $\leq 15\%$ dependence on any one sector / group
-

Criticality = High



Criticality = Low

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:

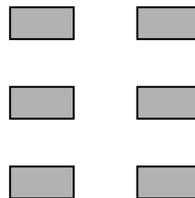
Potential Failure Mode	Potential Effect	Sev	Potential Causes	Occ	Current Controls	D	RPN
Inadequate no. or mix of workshops	Impacts revenues from branded products and services	4	Lack of direction / definition on topics	2	Market surveys	2	16
Delays / problems with trg. Center	Impacts revenues from branded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

FMEA – High Level

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

Potential Failure Mode	Potential Effect	Sev	Potential Causes	Occ	Current Controls	RPN
Inadequate no. or mix of available products and services	Projects reviewed from broadest products and services	4	Lack of direction / definition on options	2	Market surveys	2 16
Delays / problems with sig. Control	Projects reviewed from broadest products and services	4	No Project Manager assigned	5	None	5 100
Marketing plans not developed or implemented	Missed goal of 20+ corporate clients	5	Marketing team not directed	3	Plan reviews	2 30
Insufficient cash resources to sustain team/turn	Out of business??	5	Cash flow analysis not correct	3	Quarterly cash flow analysis	2 30
Low cash flow - cannot fund future growth	Projects reviewed from broadest products and services	4	Cash flow analysis not correct	3	Quarterly cash flow analysis	2 16
		4	Delayed payments from customers	5	None	5 20



6 FMEAs created from one High Level FMEA

FMEA – Cascading

Potential Failures – Training Center:

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

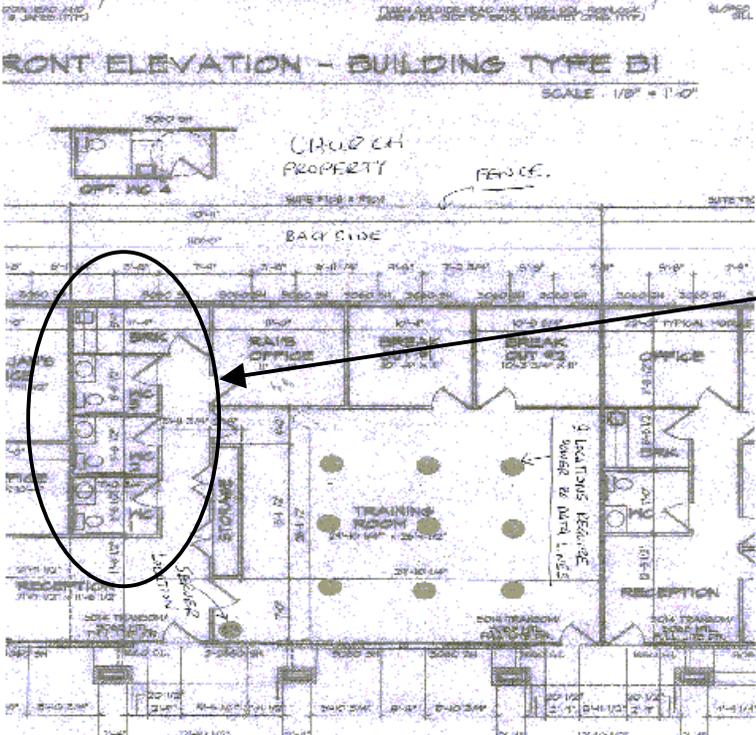
FMEA – Cascading

Potential Failures (Training Center) vs Reality:

Focus / Subject of Analysis:	Delays / problems with trg. Center	
Potential Failure Mode	Reality Check	Implemented Corrective Action
Non compliance with code	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.	Problem was detected and fixed before prints were finalized! Number of restrooms increased from 1 to 3, and converted to unisex
Injury to participants	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	Re-work by contractor to fix high profile outlets
Parking difficulties	Number of spaces available to park was 17, training center capacity was 35.	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
Nature caused catastrophe Tornadoes, / storms, etc.	Round Rock is susceptible to have tornadoes / storms	Weather warning radio installed

Sample Results

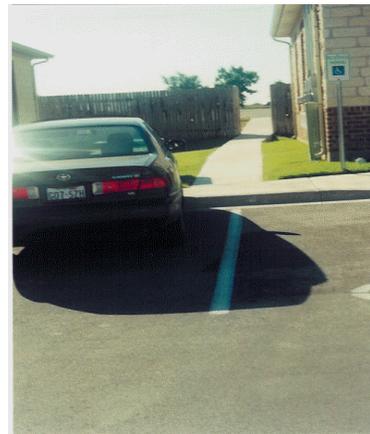
Non Compliance With City Code:



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 dis satisfied 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 – in spite 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!