Using Leading Indicators to Continuously Improve QHSE Performance

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Agenda

- Brief Syntex Background
  - Who we are and what we do
- Leading Indicators
  - What are they?
- The Mission
  - Find leading indicators from a vast data set
- The Process
  - Identify, Group and Correlate
- The Initial Results
  - AND the Analysis Reveals?
- Practical Application
  - Field use
The Roots of Syntex

- 1995 - Syntex Management Systems, Inc. Founded
  - First 5 years developed ~100 software apps in Energy industry
- 1997 - IMPACT born from “Risk Reduction Cycle” process pattern
  - EHS Incidents, inspections, assessments, observations fit a common pattern
- 2000 - Syntex commits entire business exclusively to IMPACT

The Risk Reduction Cycle “Process Pattern”

1. Discover the exposure.
   - Reactive via Incident-based Events
   - Proactive via “Assessment-based” Events

   - Risk Matrix, Hazards, Controls, Recommendations
     - Reactive = Risk Matrix, Investigations, Mgmt Systems
     - Proactive = Risk Matrix, Findings, Checklist Items

3. Execute reduction tasks.
   - Risk Reduction Action Items
Leading Indicators – what are they?

- # of Near Misses reported
- # of Observations conducted
- % On Time Completion of Action Items
- % On Time Completion of Safety Critical Inspections
- % MOC’s properly executed
- % On Time Completion of Safety Training
- Etc……

What are you using??
The Mission

Finding & using “leading” metrics from statistical analysis of historical data…
The Historical Data Set

- Derived from companies using a common “tool”
- Implemented a database of events and actions
- Business Process Automation measurements

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Over 800,000 users
Over 140 countries & 24 languages
Millions of rows of leading and lagging risk event data!
Database of Risk Reduction Process Events

....The organization’s collection of ALL events that result in risk reduction.

Over 1MM incident / near-misses

Service / Product Quality
Injuries / Illnesses
Releases / Spill
Reliability / Equipment Failure
Asset Damage
Security Incident
Reputation Damage
Other “kinds” of loss events....

Centralized Database
(per each customer)

Millions of Action Items

Action Items Resulting in Risk Reduction

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Not Only the Event Data
BUT the
Data From the Business Process
Behind the Events as Well…
Design to Enable / Measure the Event Process Lifecycle

**Example Incident Process Flow**

- **Incident or Near Miss**
  - Incident: Submit Report
    - Consequences: Open
      - Investigation: Draft
    - Review
      - Closed
    - Close

  **Action Item: Open**

- **Report incident**
  - Reporter
    - Other Systems
      - Anyone
        - Detect event
    - Approvers
      - Responsible Supervisor
        - Incident Owner
          - Auto-assigned from Site-managed role
  - Management

**Total event reporting (balanced pyramid):**
- Rate of lower severity events vs. total events
- Distribution of reporting across sites
- Distribution of reporting among front-line employees
- Timeliness of reporting vs. occurrence

**Effectiveness of event “processing”:**
- Rate of events that are investigated with approved methods
- Rate of events that are risk-rated
- Completeness of event information

**Leadership commitment / follow-up:**
- Rate of review / approval of causal factors, findings
- Rate of participation in “non-mandatory” events
- Rate of review / approval of action items
- Timeliness of approvals

**Action item execution:**
- Percent of actions complete on-time
- Risk-weighted on-time completion rate
- Rate and timeliness of past due action items

**Front-line management responsiveness:**
- Responsiveness: who is responding, who is not
- Timeliness of responses by person / occupation
- Responsiveness / timeliness by site / department
The Process

- Identify the “meaningful” data
- Grouping the metrics
- Correlating the metrics to outcomes
Identifying “Meaningful” Data

- A recent quote from a customer executive
  - “We’ve implemented a corporate wide event database. Now, let’s get to the meaningful data from IMPACT to enable our managers to lead performance improvement”

- What is “Meaningful”?  
  - Variation in measurements
    - Opportunity to improve (i.e. some good & some not so good)
Meaningful ➔ “Variation” in Metrics

**Loss Rates Over Time**
- Bottom 20% (Worst Performers)
- Top 20% (Best Performers)

**Variation in Lagging Performance**
- Some good and some bad

**Low priority action**
- % on-time
- NO VARIATION in leading metric
- No differentiation - good from bad

**Near misses as**
- % of total incidents
- VARIATION in leading metric
- OPPORTUNITY to improve
Meaningful Metrics per Full Process Lifecycle

- Near Miss Reporting (% of total inc’s reported)
- Event Data
- Risk Matrix
- Root Cause / Findings
- Action Items

Risk Reduction Process Lifecycle

- Sources of Exposure
- Risk Reduction Cycle
- Iterate Where Applicable
- Reported
- Reduced

Action Item Execution (% of “high” actions on-time)

- Time to First Action (avg # of days inc to 1st action)
- Time to Response (avg # of days in DRAFT)
- Rigor of Incident Process (% of inc w/ root cause or risk)

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Example Detailed Metrics Discovered:

- Communication (3 metrics)
- Employee Participation (16 metrics)
- Employee Reporting (8 metrics)
- Proactive Activity (11 metrics)
- Distribution of Participation (11 metrics)
- Pyramid Ratios (9 metrics)
- Percent On-time (11 metrics)
- Rate of Action Follow-up (11 metrics)
- Raw Timeliness (7 metrics)
- Leadership Involvement (11 metrics)
- Organizational Discipline (12 metrics)
- Process Execution (13 metrics)
- Process/Usage (17 metrics)
- Risk-based Process (12 metrics)

NOTE: Defined over 200 potential metrics...
Grouping the Potential Metrics
Factor Analysis: From >200 Metrics to a Few Indices

LOW mean time between incident occurrence and first action item assigned

HIGH % of incident events which result in action item

HIGH % of incident events which have either causation or risk assessment

A “Factor” ➞ These 3 things co-exist in the same places.

Proposed SME inference = an “Incident Process Execution” Index
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Customer Example – List of Factors (Indices)

From > 200 defined metrics to 10 “Factors” with Factor Analysis

- **Factor 1 – Leader Stewardship**
  - Total action duration as a % of planned duration, consistency in total duration of incident process
- **Factor 2 – Action Timeliness**
  - Rate of on-time action completion
- **Factor 3 – Reporting Culture**
  - Rate of incident and action involvement per work-hours, ratio of near-miss to incidents
- **Factor 4 – Front-line Reporter Responsiveness**
  - Timeliness between event occurrence and processed via IMPACT
- **Factor 5 – Supervisor Responsiveness**
  - Timeliness between first report entry and supervisor “open” event
- **Factor 6 – Investigation Timeliness**
  - Timeliness between event occurrence and investigation entry for Incident and near misses
- **Factor 7 – IM Process Execution**
  - % of total events with investigation, % of total events with action, mean time from event to 1st action
- **Factor 8 – Leader Process Discipline**
  - Lateness of late actions, total duration of incident process, overall timeliness of actions
- **Factor 9 – Front-line Reporter Discipline**
  - Consistency in timeliness between date reported and date entered into IMPACT
- **Factor 10 – Late Action Follow-up**
  - Overall lateness of late actions

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The Groupings....

- Communication (3 metric)
- Employee Participation (16 metrics)
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- Process/Usage (17 metrics)
- Risk-based Process (12 metrics)
Correlating the Leading Indicators to Lagging Performance

The INITIAL Results Revealed!
Which one(s) of these have been proven to have the biggest IMPACT on lagging performance?

- **Factor 1 – Leader Stewardship**
  - Total action duration as a % of planned duration, consistency in total duration of incident process

- **Factor 2 – Action Timeliness**
  - Rate of on-time action completion

- **Factor 3 – Reporting Culture**
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Field Practicality/Use...

CCPS Process Safety Metrics

“You don’t improve what you don’t measure”
Design / Develop a KPI Dashboard

- Select the metrics most APPLICABLE to your company (i.e. current initiative, external / internal benchmarks, etc.)
- For each selected metric, establish a KPI (Key Performance Indicator) measurement scale...

- Good performance per chosen scale
- Poor performance per chosen scale
Using Math-proven KPI’s to Improve Performance

**TRIR**

<table>
<thead>
<tr>
<th>Site 1</th>
<th>Site 2</th>
<th>Site 5</th>
<th>Site 6</th>
<th>Site 7</th>
<th>Site 8</th>
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</thead>
<tbody>
<tr>
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<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
<td>Good</td>
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</tbody>
</table>

**Leading KPI 1**

**Leading KPI 2**

**Leading KPI 3**

**Leading KPI 4**

* 12 Month rolling performance metrics.

**Example KPI:** Incident Process Execution (index)

**Legend**

- Poor
- Fair
- Good

**Site 6 Management Response**

Actionable “measures” as management controls to continuously improve the organizational factors that lead to better performance.
# Customer Example Scorecard

<table>
<thead>
<tr>
<th>Division</th>
<th>Total Incident Reporting Rate</th>
<th>Safety Triangle Ratio (as %)</th>
<th>% High Actions On Time</th>
<th>Days to Accept 1st Action</th>
<th>Avg Days to Supv Response</th>
<th>% Incidents with Actions</th>
<th>% Lateness of Late Actions</th>
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<tbody>
<tr>
<td>Div 1</td>
<td>9.33</td>
<td>37%</td>
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<td>65%</td>
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<tr>
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<td>0%</td>
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<td>64%</td>
<td>71%</td>
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<td>Corp Mean</td>
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<td>61%</td>
<td>10.24</td>
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<td>1st Quartile</td>
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<td>6.30</td>
<td>71%</td>
<td>31%</td>
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</tbody>
</table>

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Questions??