Assessing safety culture: Old wine in a new bottle

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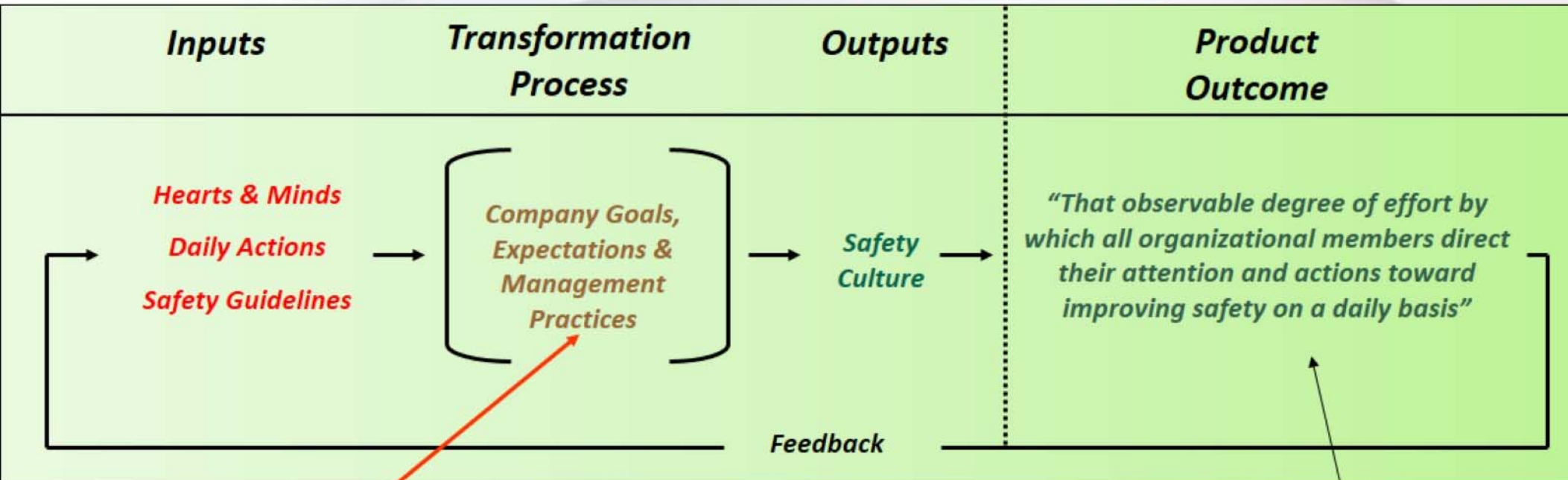
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*Safety Culture loosely used to describe 'the corporate atmosphere or 'culture' whereby **safe production** is understood to be, and is accepted as, the number one priority' (after Lord Cullen (1990), the Piper Alpha Disaster)*

Safety Culture Elements are:

Psychological Aspects	Behavioral Aspects	Situational Aspects
"How People Feel"	**"What People Do"**	**"What the Organization Has"**
Individual and group values, attitudes, and perceptions about safety.	Safety-related Actions and Behaviors; Visible Safety Leadership;	Policies, Procedures, Regulation, Organizational Structures And Management Systems.
"Hearts & Minds"	**"Daily Actions"**	**"Safety Guidelines"**

Cooper, M.D. (2000). "Towards a Model of Safety Culture", *Safety Science, 32 (6), 111-136.*

Background: Business Process Model of Safety Culture

Inputs	Transformation Process	Outputs	Product Outcome
Hearts & Minds **Daily Actions** **Safety Guidelines**	*Company Goals, Expectations & Management Practices*	**Safety Culture**	*"That observable degree of effort by which all organizational members direct their attention and actions toward improving safety on a daily basis"*

Feedback

Leadership: A Key Aspect of creating / maintaining a 'Good' Safety Culture

Can be used to assess how much 'effort' People put into safety. i.e. What do they do & When?

Academic and practitioner research has <u>independently</u> identified 7 problem areas of safety culture:

### Psychological Aspects of Safety Culture:
1. a culture of 'profit before safety'
2. a culture of 'fear' so that problems remain hidden

Behavioral Aspects of Safety Culture:
3. a culture of 'ineffective safety leadership'
4. a culture of 'non-compliance' to rules & procedures

Situational Aspects of Safety Culture:
5. a culture of 'miscommunication
6. a culture of 'competency failures'
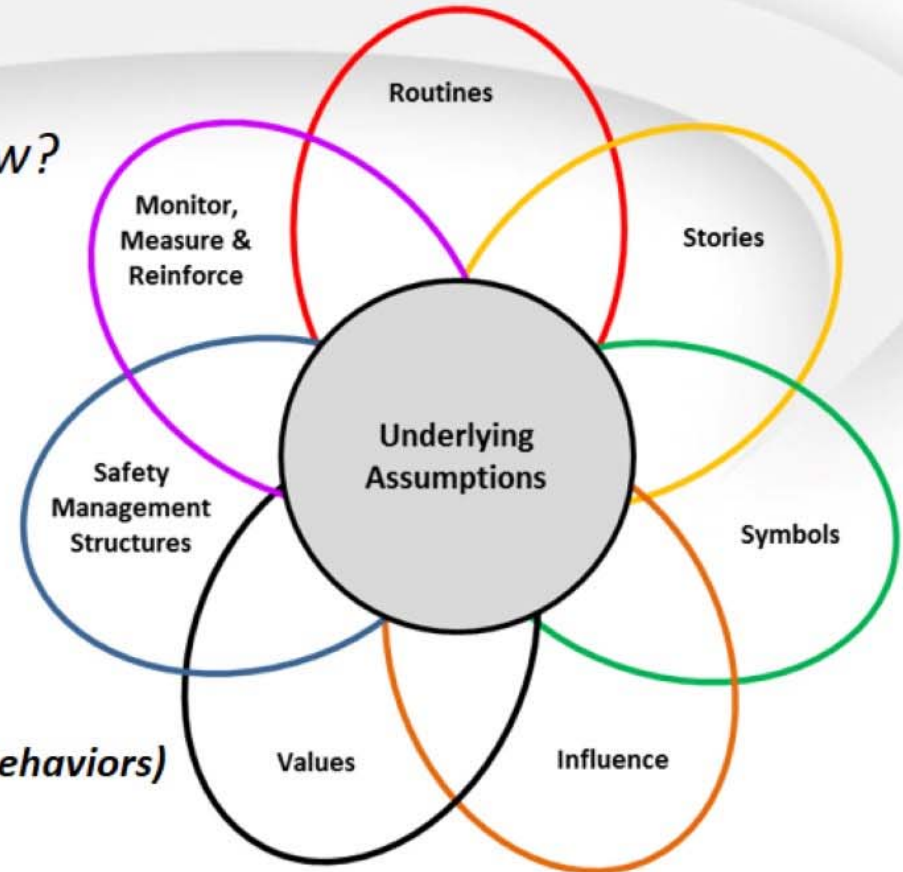7. a culture of ignoring 'lessons learned'

Psychology

Situation ← → Behaviour
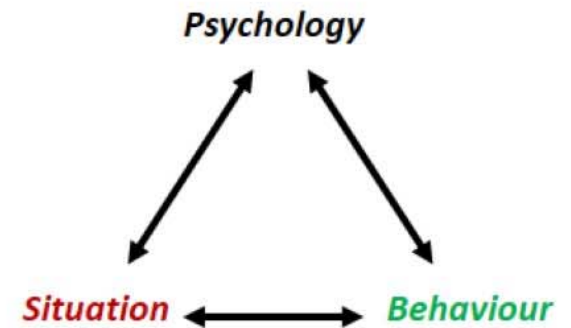
Broken into Three Parts:

Part 1: What your safety culture looks like now?

Part 2: Where do you want to be?

Part 3: How are you going to get there?

Numeric Effectiveness Rating Scale (impact on safety-related behaviors)

1. **Low** – *Not effective at all*
3. **Fairly low** – *Moderate effects can be seen*
5. **Average** – *Some effects are obvious*
7. **Good** – *Usually influences what we do*
9. **High** – *Strongly influences everything we do*
10. **Very High** = *Very effective in influencing people's safety behavior*

Routines

Monitor, Measure & Reinforce

Stories

Safety Management Structures

Underlying Assumptions

Symbols

Values

Influence

Over a three-week period in August/September 2016, 15 Cultural Web Workshops were held in Canada and the USA to conduct a safety culture assessment.

Sample:

Some 700 delegates took part
- Approx. 40-50 delegates attended each workshop

110 delegate groups participated:
- 3 Corporate groups
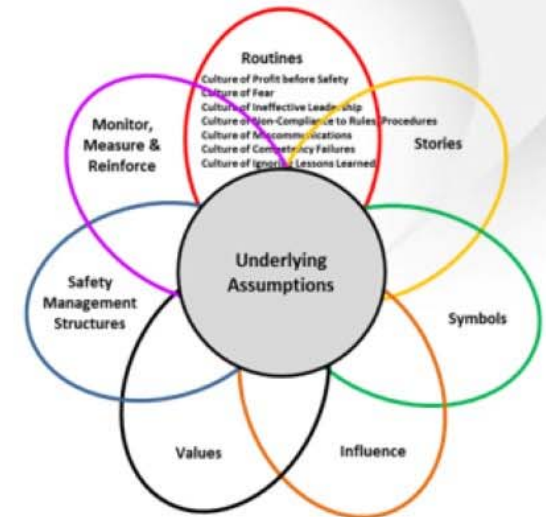- 7 Wholesale Sites
- 7 Retail Regions

The full spectrum of the company's activities were involved
- Corporate Leadership Teams
- Plant Leadership
- EHS, OEE, Corporate Support Services
- Crop Services, Mining, Maintenance, Terminals, and Warehousing

Results: Data Processing

- Completed documentation couriered overnight to BSMS
- Data transcribed, collated, analyzed
- Responses for *each of the 8 Cultural Web topics* were sub-divided into the seven broken safety culture features.

- **Culture of Profit before Safety**
- **Culture of Fear**

⎤ **Hearts & Minds**

- **Culture of Ineffective Leadership**
- **Culture of Non-Compliance to Rules/Procedures**

⎤ **Daily Actions**

- **Culture of Miscommunications**
- **Culture of Competency Failures**
- **Culture of Ignoring Lessons Learned**

⎤ **Safety Guidelines**

- Idea was to provide in-depth focus to guide Company's safety culture journey to help avoid any catastrophic events.

- **Data Analysis:**
  - The 'Effectiveness' ratings were entered into statistical software (SPSS)
  - Produced 'mean average' effectiveness rating for all topics for each workshop.
  - Used Multiple Regression Analysis to identify influences on Incident Rates

- No statistically significant differences between groups; locations, Business Units, or Employment Category
  - Thus Safety Culture was Shared and Stable – Both are key elements of culture

- Reliability of the assessment (Cronbach's Alpha - a measure of consistency) was 0.845 (Cultural Web Topics) & 0.848 (Broken Safety Culture Topics)
  - Ideal = 0.80 - 0.90

- Criterion-related Validity (The association with actual safety performance) for TRIR/CW was (r=0.488, p<.01) and for TRIR/BSC was (r=0.417, p<0.01).
  Academic Ideal: r= > 0.45; Industry Ideal: r= >0.35 (US Dept. of Labor)

Results: Predictive Analytics – Cultural Web Topics

Types of Incident (DV)	Cultural Web Topics - Predictors (IV)	Adj. R^2	F	Sig.
Total Recordable Incident Rate (TRIR)	Assumptions (Stories), Safety Values Displayed	0.35	14.99	.01
Number of Lost-time incidents (LTI)	Safety Values Displayed	0.29	16.54	.01
Number of Recordable Injuries (REC)	Assumptions (Stories)	0.28	21.94	.01
Potential Serious Injuries & Fatalities (PSIFs)	Monitor, Measure & Reinforce, Stories about Safety	0.25	9.89	.01
Number of Near-Misses	Stories about Safety	0.19	14.99	.01
Serious Injuries & Fatalities (SIFs)	Monitor, Measure & Reinforce	0.14	5.84	.02
Restricted Work Cases (RWC)	Safety Values Displayed	0.14	7.08	.01
Number of First-Aids	Safety Values Displayed, Assumptions (Stories)	0.14	5.24	.03
Lost-Time Incident Rate (LTIR)	None	-	-	-

Safety Values Displayed = 4; Assumptions (Stories) = 3; Monitor, Measure & reinforce = 2; Stories about safety = 2

Predictive Analytics – Safety Culture Topics

Types of Incident (DV)	Safety Culture Topics - Predictors (IV)	Adj. R2	F,	Sig.
Serious Injuries & Fatalities (SIFs)	Fear, Compliance, Competency	0.45	10.12	.01
Number of Recordable Injuries (REC)	Profit before Safety, Lessons Learned, Fear	0.42	16.48	.01
Total Recordable Incident Rate (TRIR)	Fear, Profit before Safety	0.41	23.18	.01
Lost-Time Incident Rate (LTIR)	Competency, Fear, Compliance	0.36	9.88	.01
Number of Lost-time incidents (LTI)	Fear, Profit before Safety, Communication	0.35	9.44	.01
Number of First-Aids (FA)	Competency, Compliance, Fear	0.26	9.50	.01
Number of Restricted Work Cases (RWC)	Lessons Learned, Profit before Safety, Communication	0.24	5.52	.01
Potential Serious Injuries & Fatalities (PSIFs)	Competency, Fear	0.14	6.19	.01
Near-Misses (NM)	Profit before Safety	0.08	7.72	.01

Culture of Fear= 7; Profit before Safety = 5; Competency = 4; Compliance = 3; Communication= 2; Lessons Learned = 2

- **Schein/Guldemund (2000) – 3 layer model**
  - Behaviours & Artefacts (top); Espoused Values (middle); Core Basic Assumptions (bottom)

- **Cooper (2000) Reciprocal Safety Culture Model**
  - Psychological, Behavioural and Situational Factors

- **Reason (1998) Reciprocal Safety Culture Model**
  - Just, Informed, flexible, Reporting & Learning cultures

Predictive Analytics – Composite Cultural Web Topics

Types of Incident (DV)	Cultural Web Topics Predictors (IV)	Adj. R2	F	Sig.
Number of Lost-time incidents (LTI)	Behaviour, Situation	0.33	10.37	.01
Number of Recordable Injuries (REC)	Behaviour	0.25	19.09	.01
Total Recordable Incident Rate (TRIR)	Behaviour, Situation	0.25	9.58	.01
Serious Injuries & Fatalities (SIFs)	Behaviour	0.11	4.77	.04
Number of Near-Misses	Behaviour, Situation	0.11	4.50	.02
Number of Restricted Work Cases (RWC)	Behaviour	0.10	5.38	.03
Potential Serious Injuries & Fatalities (PSIFs)	Behaviour	0.03	1.60	n.s.
Number of First-Aids	Behaviour	0.02	2.32	n.s.
Lost-Time Incident Rate (LTIR)	Behaviour	0.01	1.37	n.s.

Results show a focus on optimising both the situation and behaviour, rather than just focusing on psychological or behavioural variables, will exert a positive influence on adverse safety incidents

Predictive Analytics – Composite Broken Safety Culture Topics

Types of Incident (DV)	Safety Culture Topics (IV)	Adj. R2	F,	Sig.
Total Recordable Incident Rate (TRIR)	Psychology, Behaviour, Situation	0.44	17.99	0.01
Number of Lost-time incidents (LTI)	Behaviour, Situation	0.33	8.79	0.01
Number of Recordable Injuries (REC)	Psychology, Behaviour, Situation	0.31	10.86	0.01
Serious Injuries & Fatalities (SIFs)	Behaviour, Situation	0.19	4.79	0.02
Lost-Time Incident Rate (LTIR)	Behaviour, Situation	0.12	4.11	0.02
Number of First-Aids (FA)	Behaviour, Situation	0.09	4.53	0.01
Number of Near-Misses (NM)	Psychology, Behaviour, Situation	0.09	3.45	0.02
Potential Serious Injuries & Fatalities (PSIFs)	Behaviour, Situation	0.06	3.26	0.05
Number of Restricted Work Cases (RWC)	Behaviour, Situation	0.01	0.71	n.s.

Results again show a focus on optimising psychology, situations and behaviour, will exert a positive influence on adverse safety incidents,

Summary: Testing of Safety Culture Models

- **Schein/Guldenmund (2000) – Limited evidence** to support central thesis that assumptions are the safety culture

- Assumptions (about safety stories) plus behavior (Safety Values displayed) and artefacts (Monitor, Measure & Reinforce and Stories about safety)

- **Cooper (2000) – Model Supported**
  - – Cultural Web Topics – Behaviour/Situation links – LTI's, TRIR & # of Near-Misses
    - Behavioural variables explains remainder
  - Broken Safety Culture Topics
    - – Psychology/Behaviour/Situation topics explain TRIR, # of Recordables & # of Near-Misses
    - - Behaviour/Situation topics explain remainder

- **Reason (1998) – Partial Support – Culture of Fear related to 7 types of incident**
  - Some support for Lessons Learned (Reporting & Learning Cultures), Communications, and Stories about safety (Informed Culture)

Predictive Analytics – Summary

Types of Incident	Cultural Web Topics	Cultural Web Topics - Composite	Safety Culture Topics	Safety Culture Topics – Composite
Total Recordable Incident Rate (TRIR)	0.35	0.25	0.41	**0.44**
Serious Injuries & Fatalities (SIFs)	0.14	0.11	**0.45**	0.19
Number of Lost-time incidents (LTI)	0.29	0.33	**0.35**	0.33
Lost-Time Incident Rate (LTIR)	-	-	**0.36**	0.12
Number of Recordable Injuries (REC)	0.28	0.25	**0.42**	0.31
Number of Restricted Work Cases (RWC)	0.14	0.10	**0.24**	n.s.
Number of First-Aids (FA)	0.14	n.s.	**0.26**	0.09
Number of Near-Misses (NM)	**0.19**	0.11	0.08	0.09
Potential Serious Injuries & Fatalities (PSIFs)	**0.25**	n.s.	0.14	0.06
Average Criterion–Related Validity Coefficient	*0.22*	*0.19*	*0.30*	*0.20*

In general, a focus on the Broken Safety Culture topics will provide stronger relationships with incident statistics

- Cultural web topics give clues about the mechanisms to change culture, while the safety culture topics help to identify the specific safety characteristics to change (i.e. the what and the how).

- Cultural Web & Broken safety culture topics are unequivocally related to safety performance

- Cultural Web tool as described is a much better tool than safety surveys for safety culture assessment

- Place primary intervention focus on **situation – behaviour** link

- Try to eliminate the culture of fear and culture of profit before safety