A Disruptive Paradigm: The Systems Approach to Human Error

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What Do You Believe?

- Human Errors result from bad **Choices**
- Human Errors result from **Mistakes**
- **Errors** and **Violations** are the same
Oscar gaffe was just ‘human error’

By CAITLIN GIBSON and MONICA HESSE • Washington Post

LOS ANGELES – At the climactic final moment of the 89th Academy Awards, when Faye Dunaway read the name of the film printed on the card in front of her — “La La Land!” — there were two people standing on either side of the stage who knew immediately that a different film, “Moonlight,” was the actual winner of the Oscar for best picture.

But no one else knew, not until the ceremony was interrupted nearly two full minutes later, after multiple “La La” creators had already given acceptance speeches. It was an agonizing unspooling of awkwardness that a PricewaterhouseCoopers executive described to reporters Monday as “a human error.”

As Tim Ryan, chairman and senior partner of the accounting firm that has long been the keeper of the Oscar envelope, described the scenario, one of the so-called Oscar “ballot leaders” simply handed co-presenter Warren Beatty the wrong envelope — with a spare copy of the card awarding Emma Stone the best actress prize for her role in See OSCARS on A6
Session Objectives:

- Understanding the differences between at-risk behavior and normal human error
- Discuss the massive paradigm shift that is occurring
  - Away from seeing worker behavior as the key problem
  - Toward the understanding that behavior is systematically influenced, versus based on individual choice
  - Recognizing the need for finding organizational and system influencers, and engaging workers in the process
Disrupting or “Shifting” the Paradigm

Thomas Kuhn - “The Structures of Scientific Revolution”
Popularized the term “Paradigm Shift”

“There is not evolutionary change in science, but rather a series of peaceful interludes punctuated by intellectually violent revolutions” and in those revolutions “one conceptual world view is replaced by another.”

Think how personal computers and the internet have impacted how both personal and business environments, acting as catalysts for a Disruptive Paradigm Shift.”
A Disruptive Paradigm

William Corcoran, PhD. – Meaningful change comes from disruptive paradigms

“A disruptive paradigm is a paradigm that is life-threatening to the old ways of looking at things.”

“Often when a critical mass of people in an organization or in a society adopt the disruptive paradigm the days of the other are numbered.”
Systems Thinking about ‘Human Error’ is Disruptive

It Poses Threats to……

• Our set of beliefs that we and our organizations hold about worker behavior and safety.

• Our previous approaches to safety and impending obsolescence.

• The army of behavioral safety consultants and their promises of improvement and predictive analytics
Common Beliefs will be Disrupted

• “Free Will” – we control our destiny through personal choice…. In workplace settings as well?
• Errors are the outcome of poor choice and are voluntary actions…..blame, shame, retrain…. 
• Worker behavior is the root cause of most workplace injuries
• Workplace errors are deliberate acts of violation
• Disciplinary action is necessary in holding the violator accountable
What We Know About Human Error

• Human Error is Normal and Expected

• Errors are Mistakes - Not Active Choices

• Errors help us Learn
  • Can result in learning opportunities for others…

• Error likely situations can be Identified, are Predictable and can be Redesigned
Common Beliefs About Safety

• Zero Injuries = World Class Safety
  • The number of adverse outcomes is as low as possible

• Focusing on At-Risk Behaviors will improves safety
  • Observing and Changing behaviors will improve safety

• Human Error is the result of Unsafe Behavior

• Human Error can be eliminated through training, incentives, observation and discipline
Understanding “Context”

Human minds don’t see beyond the present

• What is about to happen is not anticipated nor even possible

• What they are doing in the present has no connection to what is about to happen

• The possibility of something going wrong and being hurt simply won’t happen
Review: Errors vs. Violations

- Unsafe Acts
  - Errors
    - Decision Errors
    - Skill-Based Errors
    - Perceptual Errors
  - Violations
    - Routine Violations
    - Exceptional Violations
“There would be no problems in production or service if only our production workers would do their jobs in the way that we taught.

Pleasant Dreams!

The workers are handicapped by the system, and the system belongs to management.”
Our View of Error is Biased

• **Cognitive Bias**: a systematic error in thinking that affects the decisions and judgments that people make
  
  • How we are able to view and make sense of the world around us
  
  • Thinking Errors that humans make in processing information
Trap Door - Video

www.officeclips.com
Confirmation Bias

• The tendency to search for, interpret, focus on and remember information in a way that confirms our preconceptions

• We look for evidence or reasons to confirm what we think already happened.
Fundamental Attribution Error

• We explain behavior by assigning attributes.

• We see error or mistakes as failures resulting from poor choice.

• This results in projecting ourselves as better than the person who made the mistake.
  • We would never have done that!
Hindsight Bias

• Those looking back on an event see all the causal consequences coming.

• But those involved and in the moment, armed only with limited foresight, see no such convergence.


Counterfactual Fallacy

• Confuses the real circumstances of an event and the mental alternatives that were likely to alter the outcome.

• What “should” have been.
  • “If she had looked before entering the intersection…”
  • “If he had not been driving so fast…”
  • “If the machine guard had been in place…”

• “Had things been different (which they weren’t) this would not have happened;
  • therefore, the person who committed the act is responsible for the outcome.”
“Just World” Hypothesis

• The view that bad things happen to bad people, and conversely.

• Comes directly from Newtonian thinking and usually thought when there is a bad outcome.
Change Is Afoot In Safety!

• Away from the “Person Model”

• Focused on the work Systems and Context

• Toward the “Organizational Model” …. 

James Reason
Systems and Context Approach

- Systems Design & Organizational Control
- Focus on Climate/Culture
- Behavior Based Safety
Safe Work Design Can Make It
Poor System Design can “Provoke” Error

• Poor design – can put in motion latent conditions that can result in negative consequences

• Management decisions can potentially increase risk, and provoking error
Poor Management Systems increase the problem

• Measuring safety success through incident count and trailing indicators
• Expect compliance to rules and procedures
• Focusing on the worker as the problem
• Fixing the problem by focusing on changing the behavior of workers
• Identify unsustainable corrective actions: retraining, incentives, behavior observation, discipline, etc.
• Seldom identify organization or systems influences on behavior
Focuses on “stopping the bleeding”
Wait for “lessons learned”
Focus on “Blame”
Led by Safety

1-Compliance (Reactive)
- Focus on meeting compliance requirements
- Developing programs, policy, strategy and resources
- Individual Accountability
- Safety as a Priority
- Supervisor is “Key Person”
- Training is the Answer
- Safety Committee

2-Compliance (Proactive)
- Systematize Programs into Processes
- Institutionalize Data Collection
- Accountability at Line Management to Leading Metrics
- Risk-based focus
- Employee Involvement
- Individual Recognition
- Injury Avoidance / Prevention

3-Management Systems Focus
- Management Commitment
- Employee Engagement
- Behavior Based – Active Caring
- Communication
- Safety as a Value
- Organization and Resources
- Limiting error effects

4-Culture and Human Performance
- Risk Avoidance is the Goal
- Wellness at Home and at Work
- Integrate Safety into day-to-day business operations
- Continuous Improvement
- Safety as a Business Value
- Organizational Accountability
- Community Partnership

Safety Cultural Maturity = 5 Levels

Key Metrics
- Incidence rates
- Exposures and Hazardous conditions
- Systems Risks Recognitions
- Culture Behavior Engagement Errors
- Values Stakeholder Feedback
The first interpretation of safety

Safety is the prevention of harm (unnecessary risks).

\[ \text{Safety} = \sum_{i=1}^{n} \text{Accident}_i \]

There is an presence of failures (things that go wrong) due to risks and hazards. The number of harmful events can be counted.

It is “easy” to count how much goes wrong, but does that measure safety?

HSE performance indicators

Total recordable injury frequency
Lost-time injury frequency  Serious incident frequency  Sickness absence
Oil spills  Other spills
Compliance (Level 1 and 2)

Reactive

- Wait for things to happen
  - Incidents
  - Citations
  - Goals
  - Objectives
  - Improvement initiatives
- Investigations focus on “who”
  - Blame individual employees
  - Counsel, retrain, discipline
- Accountability - without authority
- A safety department responsibility

Proactive

- Compliance Focus
  - Audit to test compliance
  - Inspect to stay in compliance
- Written programs (to check)
- Safety Training Programs
- Individual Accountability
- Resource fixes – safety priority
- Supervisor as Key Person
- Safety Committee
- Focused on “Zero” as the Goal
Common (Safety) Performance Barriers include:

1. Unclear strategies and values, and conflicting priorities
2. An ineffective/unsupportive senior leadership team
3. Leadership style is too top-down or too laissez faire
4. Poor horizontal coordination and communications
5. Inadequate leadership and management skills development processes in the organization
6. Poor or closed vertical communications
Managing Safety

• What are the key elements of a successful Safety Initiative?

• How does your organization manage safety? Is there a defined structure or process? How do you know if you have it?

• How do you track and measure safety performance?

• How is safety managed at each location or in each section/department of the organization?
Moving beyond compliance/rules-based safety?

Thoughts to consider:

1. Compliance is often the goal …. and it probably needs to be!
2. When focused on compliance and rules we look for violators
3. When something goes wrong we look to see what rules were violated, or steps in the procedure skipped
4. Who messed up??!!
5. We then reprimand and take other actions to fix the be worker
6. The culture of the organization remains immature (levels 1 & 2)
7. Safety success continues to be measured by the number of incidents, violations, at-risk behaviors, OSHA compliance, adherence to rules, etc.
Safety Management Systems (Level 3)

- Managed Approach: Plan - Do - Check - Act
  - Systematize, integrate and layer for each program

- Data collection
  - Incidents, action tracking

- Management and Department Accountability

- Risk-Based leading metrics
  - Moving away from just “Zero” incidents

- Employee Involvement and Recognition

- Goal = Injury Avoidance
ISO 45001 - ANSI Z10 - OHSAS 18001

- **ISO 45001 CD2**
  1) Scope
  2) Normative References (n/a)
  3) Terms and Definitions
  4) Context of the Organization
  5) Leadership & Worker Participation
  6) Planning
  7) Support
  8) Operation
  9) Performance Evaluation
  10) Improvement
  11) Annex

- **ANSI/AIHA/ASSE Z10 (2012)**
  - Management Leadership & Employee Participation
  - Planning
  - Implementation and Operation
  - Evaluation and Corrective Action
  - Management Review

- **OHSAS 18001 (2007)** *
  - OH&S Policy
  - Planning
  - Implementation & Operation
  - Checking
  - Management Review
ISO 45001 - draft

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  • 11) Annex
Safety-I – when nothing goes wrong

Safety is a condition where the number of adverse outcomes (accidents / incidents / near misses) is as low as possible.

Safety-I is defined by its opposite - by the lack of safety (accidents, incidents, risks).

The premise for Safety-I is the need to understand why accidents happen.

Accidents and incidents represent a lack of safety.

How can we learn about safety by studying situations where it isn’t there?

If we want something to increase, why do we use a measure that decreases?
Managing safety by snapshots

Safety management is based on analysing situations where something went wrong, hence on a set of snapshots of a system that has failed, described in terms of individual “parts” or system structures.

Acceptable outcomes are continuous

Unacceptable outcomes are discrete
How to feel safe

The belief in causality (Causality Credo)

(1) Adverse outcomes happen because something has gone wrong (cause-effect thinking + value congruence between cause and effect).
(2) Causes can be found and treated (rational deduction).
(3) All accidents are therefore preventable (zero harm principle).

**ZERO Mindset**
We believe that all injuries and occupational illnesses are preventable.
We are responsible for preventing and correcting unsafe behaviour and work conditions.

**NO Repeats**
All unsafe practices and incidents will be investigated to determine what happened and why.
All necessary steps will be taken to prevent recurrence.

**SIMPLE**
We will adopt a common, simple set of non-negotiable standards and rules throughout the Group.
Divisional line management at all levels has the responsibility of implementing and maintaining the standards and rules.
The second interpretation of safety

Safety is the prevention of harm to patients

\[ \text{Safety} = \sum_{1}^{n} \text{Accident}_i \]

"Safety is a dynamic non-event"

\[ \text{Safety} = \sum_{1}^{n} \phi\text{Accident}_i \]

There is an presence of failures (things that go wrong) due to risks and hazards. The number of harmful events can be counted.

There is an absence of failures (things that go wrong), but as a result of active engagement. If safety is a non-event, it can neither be observed, nor measured

Is it possible to count the number of times something does not happen?
Why is it safe to drive or walk?

When we drive on the streets or move in a crowd, we continuously adjust our performance to what other people do.

Just as others continuously adjust to what we do – or will do.
Different ideas about why work is safe

Why are there different ideas about why work is safe?

And how can they be reconciled?

Work is safe because ...

Work is safe because ...

Work is safe because ...

Why are there different ideas about why work is safe?
Performance adjustments are necessary

Availability of resources (time, manpower, materials, information, etc.) may be limited and uncertain.

People adjust what they do to match the situation.

Performance variability is inevitable, ubiquitous, and necessary.

Because of resource limitations, performance adjustments will always be approximate.

Performance variability is the reason why everyday work is safe and effective.

Performance variability is the reason why things sometimes go wrong.
Same process

Different outcomes

Function (work as imagined)

Success (no adverse events)

Acceptable outcomes

Everyday work (performance variability)

Malfunction, non-compliance, error

Failure (accidents, incidents)

Unacceptable outcomes
Increase safety by facilitating work

Understanding the variability of everyday performance is the basis for safety.

Function (work as imagined)

Everyday work (performance variability)

Malfunction, non-compliance, error

Success (no adverse events)

Acceptable outcomes

Unacceptable outcomes

Failure (accidents, incidents)

Constraining performance variability to remove failures will also remove successful everyday work.
Safety II – When everything goes right

Safety-II: Safety is a condition where the number of successful outcomes (meaning everyday work) is as high as possible. It is the ability to succeed under varying conditions.

Safety is defined by its presence.

The premise for Safety-II is the need to understand everyday performance.

If the level of safety increases, the proxy measure should also increase.

Safety can only be improved by studying situations where it is present!

Safety-II is achieved by trying to make sure that things go right, rather than by preventing them from going wrong.
The third interpretation of safety

<table>
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<tr>
<th>Interpretation</th>
<th>Formula</th>
<th>Description</th>
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<td>[ \text{Safety} = \sum_{i=1}^{n} \text{(acceptable outcome)}_i ]</td>
<td>Safety is the presence of acceptable outcomes. The more there are, the safer the system is.</td>
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The focus of resilience

Resilience is an expression of how systems cope with everyday situations by adjusting their performance to the conditions. A system’s performance is resilient if it can function as required under expected and unexpected conditions alike (changes / disturbances / opportunities).

Resilience is not a system property, something it has, but a performance quality, something it does.
Two types of Safety Management

**SAFETY I**

- Zero accidents – elimination of preventable harm
- Counting adverse outcomes – things that go wrong.
- Linear thinking: eliminate, prevent, protect
- Work-as-imagined: WAI-WAD compliance

**GOALS / TARGETS:**
What is the goal or target?

**POSITION:**
Where are we now?

**MEANS:**
How can we improve?

**FOCUS:**
What should be in focus?

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**SAFETY II**

- As much as possible goes well
- Measuring processes and functions – things that go well.
- Non-linear thinking: improve, support, facilitate
- Work-as-done: Reconcile WAI-WAD
✓ To Improve Human and Organisation Performance

HOP: An Open and Involving Approach to Finding System Related Causes and Solutions
The GE Approach to HOP

“No Fault/No Blame” Criteria:

• People will make Unintentional Errors - Mistakes
• Error likely situations are Predictable
• Individual behaviors are Influenced
• Operational upsets can be Avoided
• Our Response to Failure Matters
HOP - Error Prevention Tools

- Self-checking
- Peer-checking
- Concurrent verification
- Independent verification
- Three-way communication
- STAR – stop, think, act, review
- “A real-time job pause”

- Pre-job briefing
- Post-job briefing
- Procedure use & adherence
- Problem-solving
- Questioning attitude
- Conservative decision making
- Stop & collaborate
Communicate – Learn - Adapt

Start Every Day:
• Talking About the Work/Tasks Ahead
• Expectations, Safety Concerns, Procedures
• Especially Critical Steps or Situations, and Controls

End Every Day with an L8MM:
• Discuss What Went According to Plan
• Discuss Variations and How Were They Handled
• Do We Have Any Continuing Concerns?
• Do You Have Any Suggestions for Tomorrow?
HOP Learning Teams

• Team brought together to learn – 4 to 6 workers

• First discuss the work of the day – “How did you start your day?”

• Discuss the “conditions” that existed and list

• No problem solving during the first meeting – just learning
About a week after an incident or discovery of operational drift the Learning Team starts to investigate…

1. What other task(s) do you do that are similar (or have you done) that could have lead to the same situation and outcome?

2. Do you feel you or others took, or have taken a shortcut because the “proper way” to do the task doesn’t make sense or is unnecessary? Explain.

3. What have you or others done differently in the past to avoid this same unwanted occurrence from happening? Explain.

What can we change to ensure this doesn’t happen again?
5. If you had a similar issue at your home, what would you do, or would you have done differently?

6. What ideas do you have to get others who do this same task to concentrate and focus so they do it the proper way?

7. What was different about this time that lead to this situation and outcome?

8. If we gave you a blank check to fix this issue or situation, how would you do it?
HOP Investigative Approach

When an Event Happens:

1. Are the people OK? (not, why is the line down?)
2. Is the facility, equipment, process safe and stable?
3. Tell us the Story of what happened?
4. What else could have happened?
5. What Factors led Up to this event?
6. What worked well?
7. What didn’t work well or failed?
8. Where else has a problem like this happened before?
9. Where else could this problem happen?
10. What else should we know?
Final Thoughts About Safety 2.0

• Work is normally done **Efficiently and Safely**

• Look for what is “Right”

• Learn how work is actually Done, efficiently and safely

• Use this knowledge of how & why things usually go “Right” to explain how occasionally things “Go Wrong”
Safety 2.0 – Investigation Thoughts

• Variability is normal and most often is useful, and comes from positive, well-intentioned effort and resourcefulness

• Look at all workers as Key Resources, with the resilience necessary to adapt to variability within systems
  • Workers are Not a Liability or Hazard to themselves or others, but an important source of information and knowledge

• Begin to ask questions about the reality of work.
  • How is work actually done
  • What barriers exists that result in altered procedures and method?
  • Does variability introduce new hazards or risks?
  • Are procedures and controls adequate?
  • What should we ask that we won’t think to ask?
Two types of Safety Management

**SAFETY-I**

- **Zero accidents** – elimination of preventable harm
- **Counting adverse outcomes** – things that go wrong.
- **Linear thinking**: eliminate, prevent, protect
- **Work-as-imagined**: WAI-WAD compliance

**SAFETY-II**

- **GOALS / TARGETS**: What is the goal or target?
- **POSITION**: Where are we now?
- **MEANS**: How can we improve?
- **FOCUS**: What should be in focus?
- **As much as possible goes well**
- **Measuring processes and functions** – things that go well.
- **Non-linear thinking**: Improve, support, facilitate
- **Work-as-done**: Reconcile WAI-WAD