Oil & Gas Safety and Health CONFERENCE 2016 OSHA® Exploration & Production

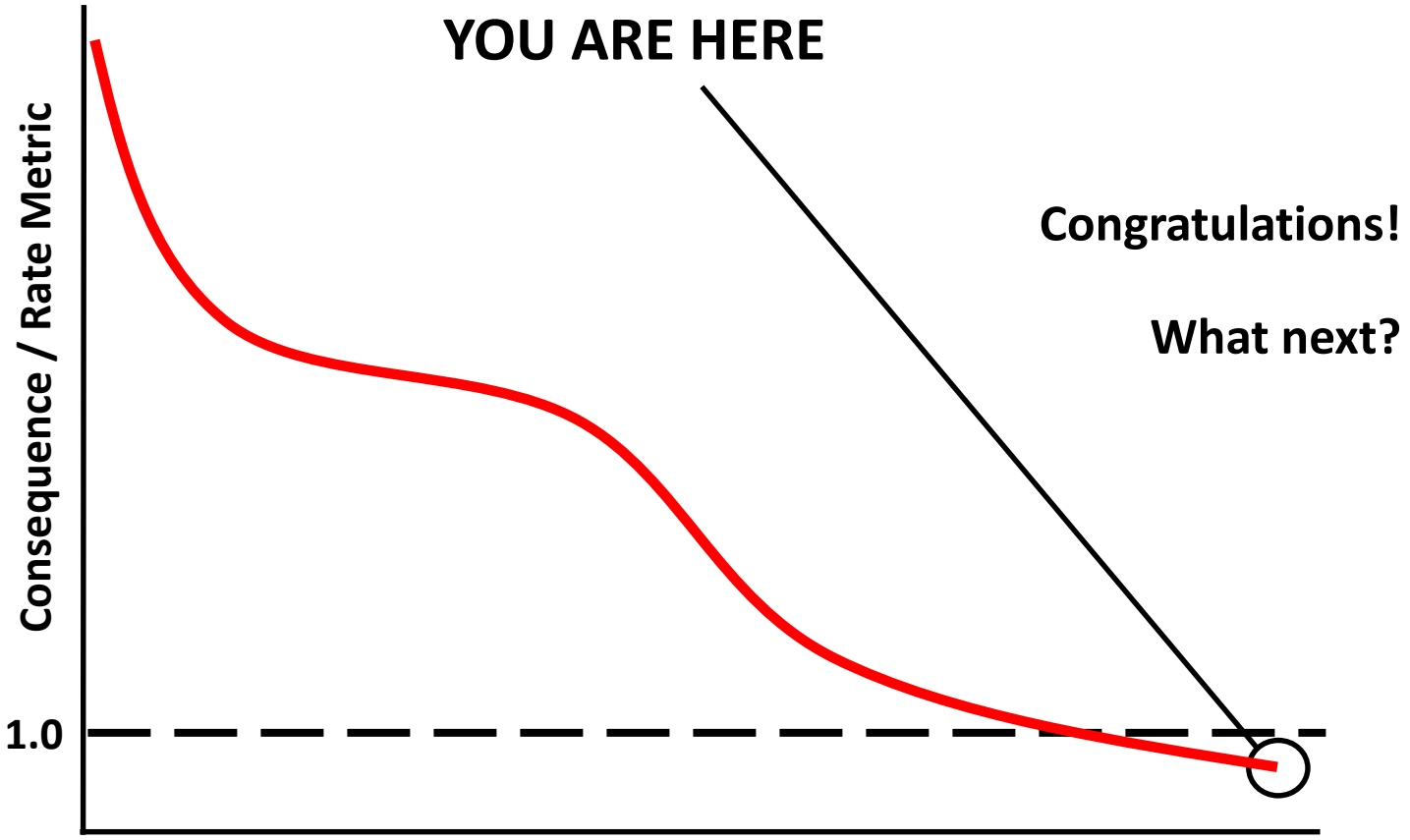
Pragmatic Inclusion of Human Factors In Incident Investigation

Norman Ritchie, vPSI Group, LLC

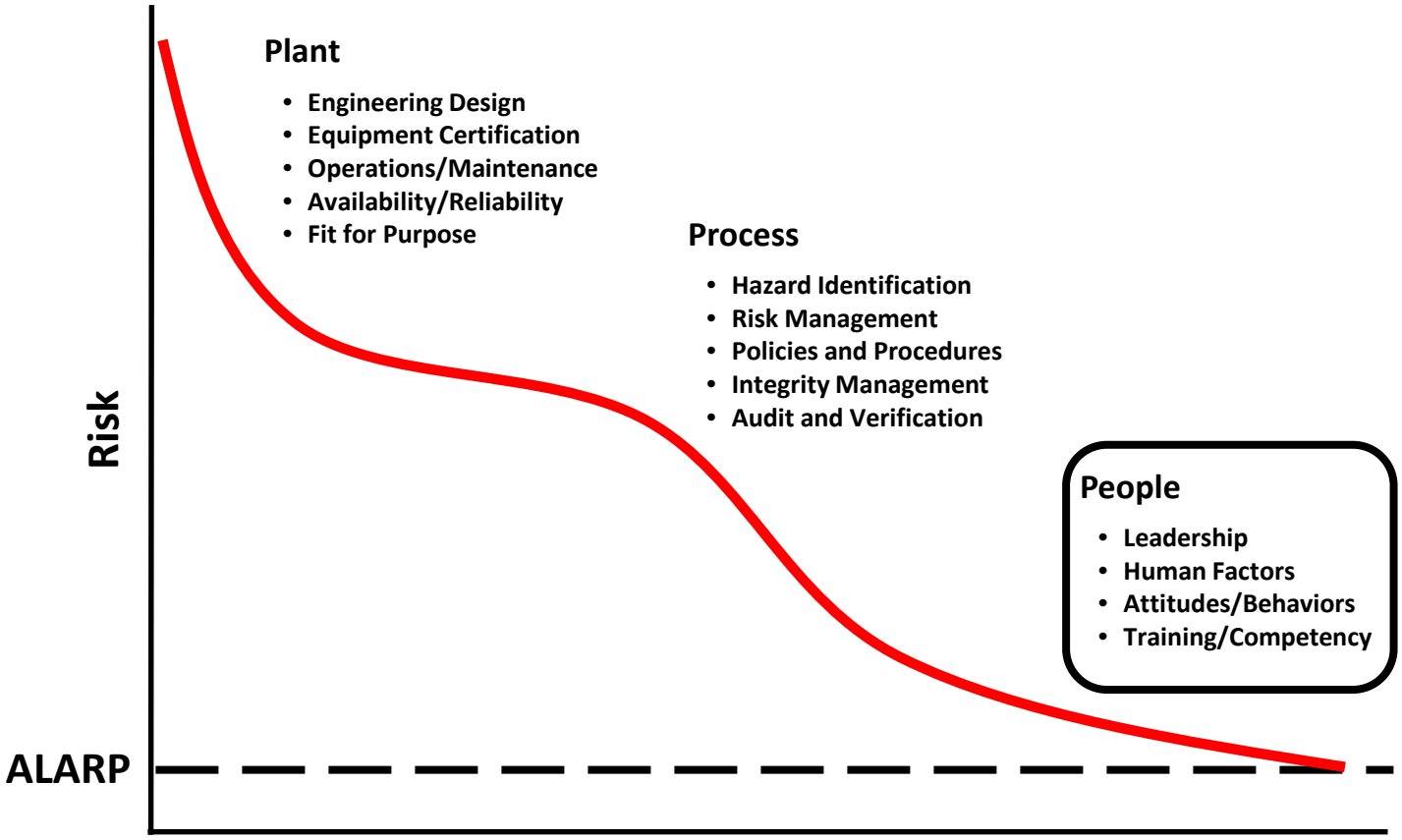
Houston, Texas

nritchie@vpsigroup.com

Why Human Factors Matter



Why Human Factors Matter



What Is / Are Human Factors?

How much is covered elsewhere e.g. in PSM, or in a different organizational function?

Where to start?

OGP (From OGP 368)

CULTURE/WORKING ENVIRONM
- Social and community value
- Communication flow within
- Acceptance and willingness for change
- Language, geography, climate
- Management support of safety values

MANAGEMENT SYSTEMS
- Compatible organizational goals
- Job safety analysis
- Quality of operating procedures/work practices
- Clear interfaces/responsibilities/accountability
- Risk management
- Safe working practices
- Work/task design issues
- Leadership

PEOPLE
- Fatigue and stress
- Training systems
- Workload and shift schedule
- Behavioral safety
- Physical and mental fitness

FACILITIES / EQUIPMENT
- Ergonomics
- Design
- Maintenance
- Reliability
- Physical layout of facilities and site
- Noise, lighting, toxics, radiation

- Safety critical communications
- Human factors in design
- Procedures
- Competence
- Organizational change
- Organizational culture
- Managing human failures
- Maintenance, inspection and testing

Common thread is Human Error / Failure

Management Program for Offshore Operations and Facilities

The interaction and application of scientific knowledge about people, facilities and management systems to improve their interaction in the work place and reduce the likelihood and/or consequences of human error.

om SPE-170575-TR n Factors Technical)

dership and Culture
- Perception of Risk and Decision-Making
- Communication of Risk
- Human Factors in Design
- Individual and Team Capacity
- Collaborative and Distributed Team Working
- Commercial and Contractual Environment
- Workload Transition
- Assurance of Safety-Critical Human Activities
- Investigation and Learning from Incidents

Center for Offshore Safety

(Draft: Work in progress) Critical Barriers and Critical Operations that require human actions in order to be implemented effectively, anticipates organizational and situational challenges to effective human action/reaction in implementing them, and identifies preventative and mitigative strategies or tactics to minimize the risk or impact of human ineffectiveness throughout the life cycle of those barriers and operations.

Challenges

- **Large number of Unplanned Events**
- **Limited investigative resources**
- **Causal analysis often resource intensive**
- **High proportion of Unplanned Events have a Human Failure component**
- **Evidentiary basis often low fidelity**
- **Humans are complicated and unavoidable**
- **Certain types of Human Failure are not preventable**
- **Corrective Actions differ according to the Human Failure type involved**

Human Failure in an Unplanned Event

Person did something other than what they intended to do

Person acted as they intended, but should have done something else to satisfy our expectations

Inadvertent At-Risk Action

Deliberate At-Risk Action

Action Error

Person believed act to be correct

Person knew act was not correct

Thinking Error

Deliberate Non-Compliance

Action-based "Slip"?
e.g. inattention

Memory-based "Lapse"?
e.g. forgetfulness

"Mistake"

Rule-based?
e.g. misapply experience to novel situation

Knowledge-based?
e.g. insufficient or incorrect procedure

"Violation"
e.g. deviates from procedure

Routine?

Situational?

Exceptional?

Is the evidentiary basis sufficient to differentiate?

Human Failure in an Unplanned Event

Routine Violations

Normalized deviance: “This is how we do it around here”. The workplace consensus is that rules and processes are only selectively applicable.

Situational Violations

Non-compliance driven by context specific and temporary factors such as lack of appropriate equipment, pressure to complete a task, insufficient manpower or time.

Exceptional Violations

Violations arising from unusual circumstances, for example if an emergency arises, a piece of critical equipment breaks down, or something goes wrong during task execution.

Human Failure in an Unplanned Event

Evidentiary basis must be sufficient to differentiate between:

Slip

Lapse

Mistake

Violation

Evidentiary basis must also be sufficient to determine whether At-Risk Act are:

Enabled

Difficult

Non-Enabled

Human Failure in an Unplanned Event

Enabled

The choice between a Safe or At-Risk act or behavior is entirely within the person's control; there are no external drivers (except possibly group norms).

Difficult

Safe performance of the task has obstacles imposed upon it (e.g. time required to fetch equipment located remotely from the task site). Safe behavior is possible but the At-Risk act or behavior is easier. Before engaging in an At-Risk act or behavior, the worker may conduct a form of cost / benefit analysis, with cost being based on a risk assessment. Note that this process may be unconscious.

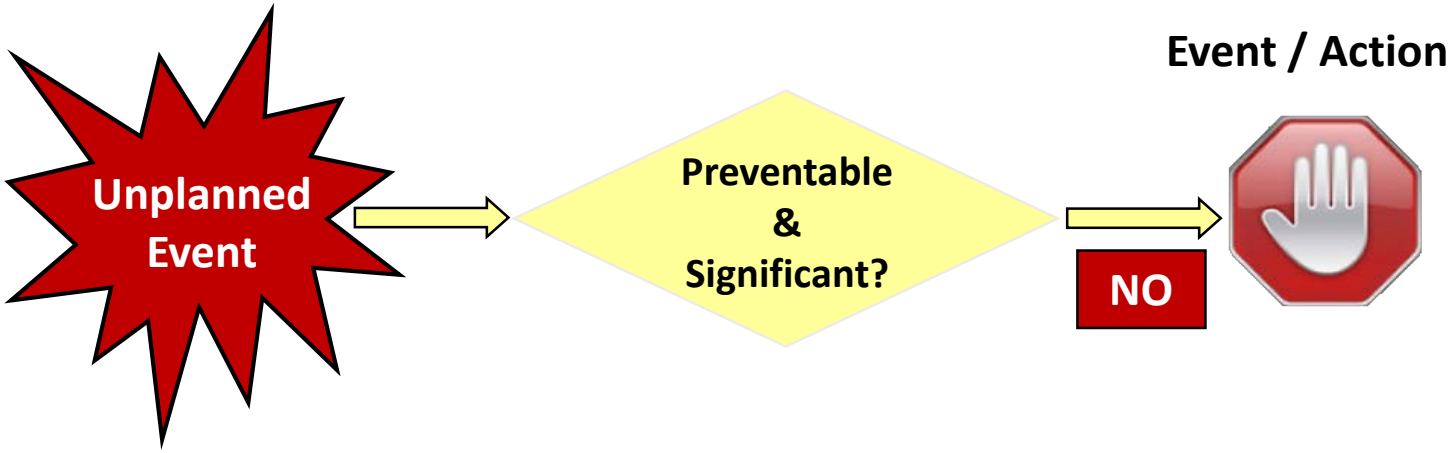
Non-Enabled

The worker is forced to engage in an At-Risk act or behavior; there is no other way to perform the task at hand. (e.g. equipment required to do the task safely not available).

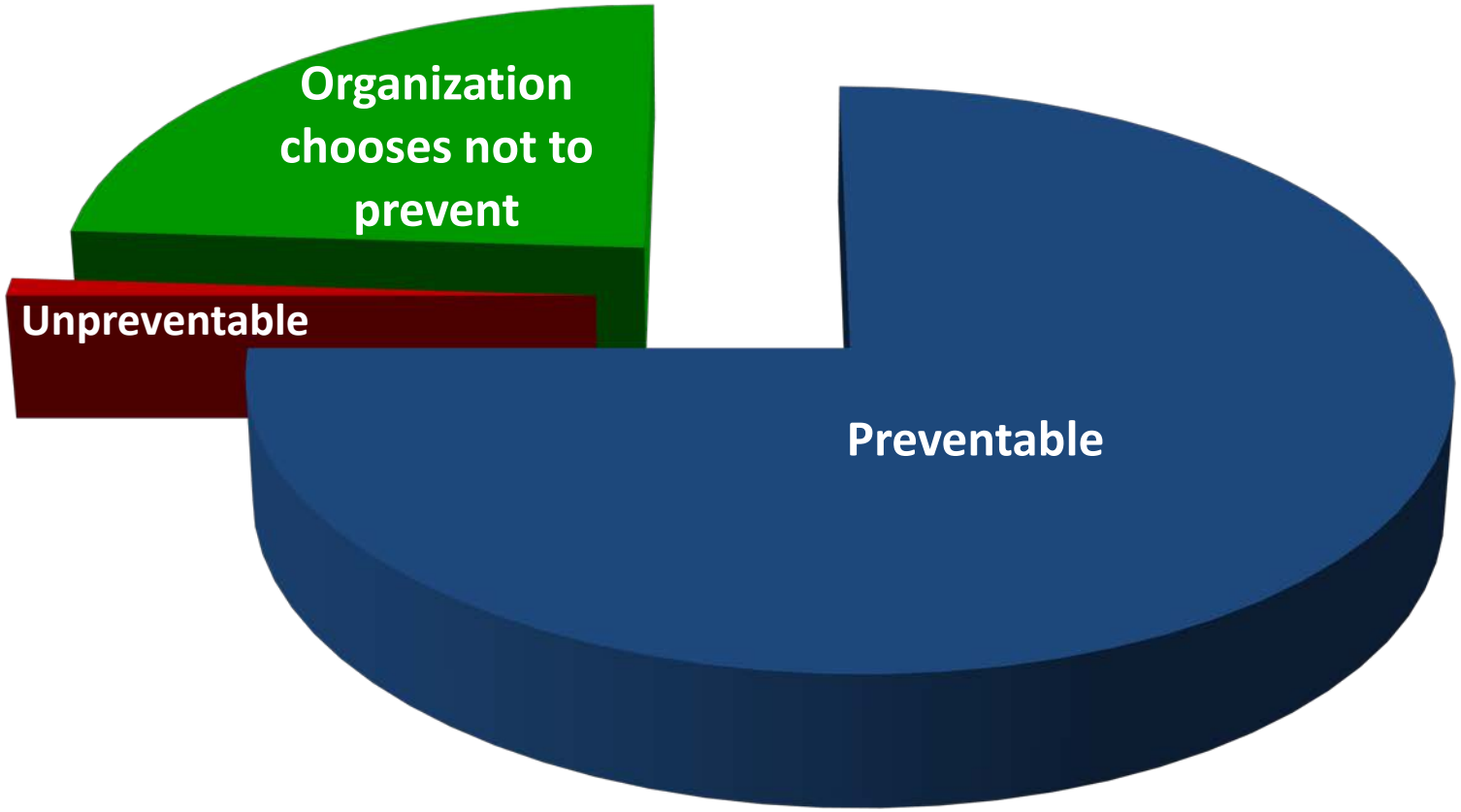
Pragmatic Resource Investment

- **Should all Human Failure related Unplanned Events be fully investigated?**
- **Which Human Failure related Unplanned Events are worth investing resources in to prevent reoccurrence?**
- **How do you decide?**

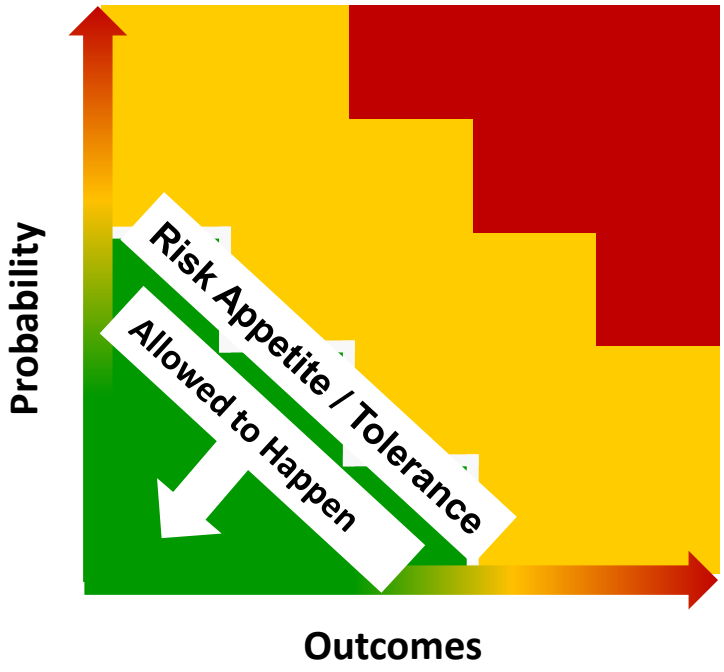
Event / Action Process Overview



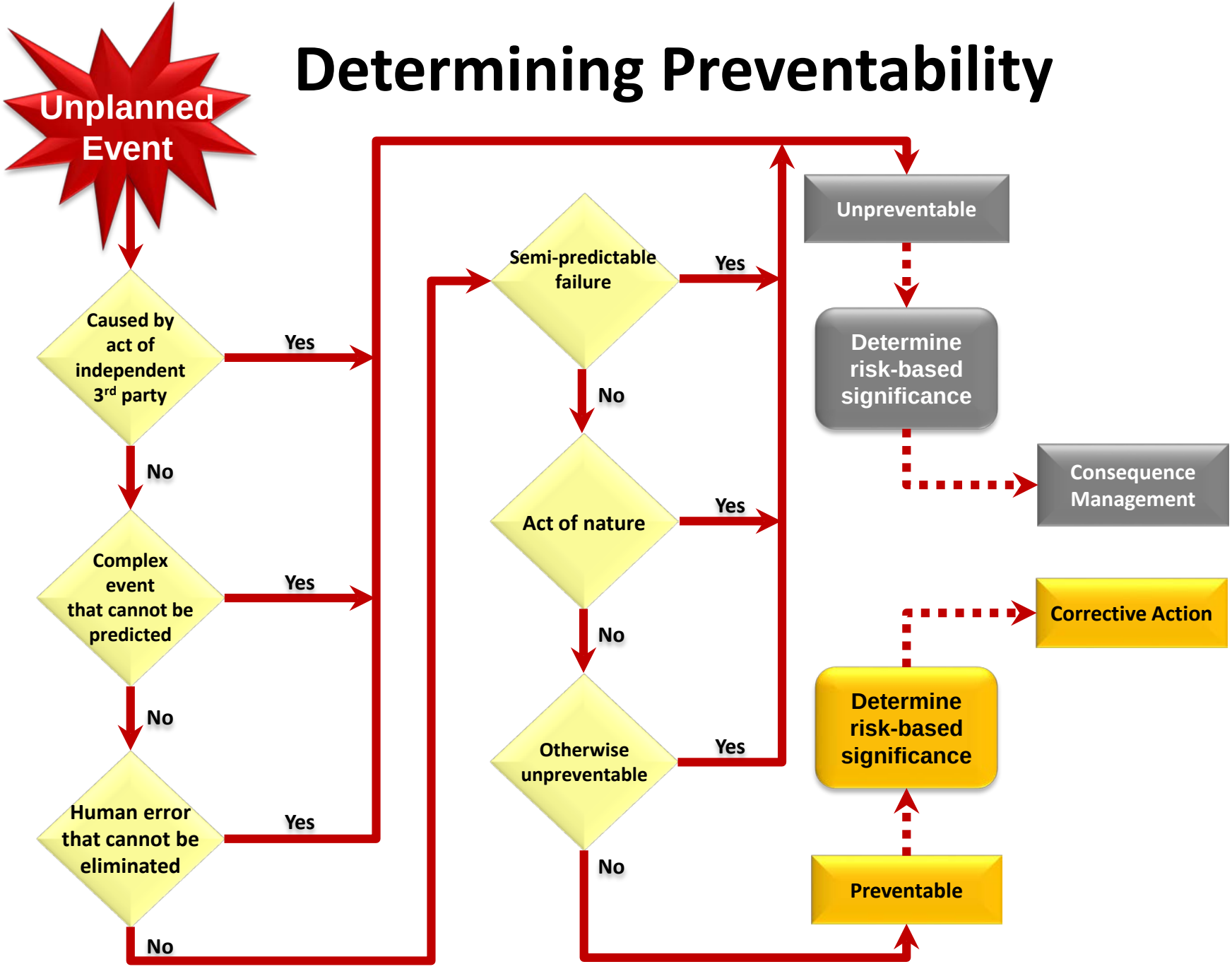
Context: Preventability



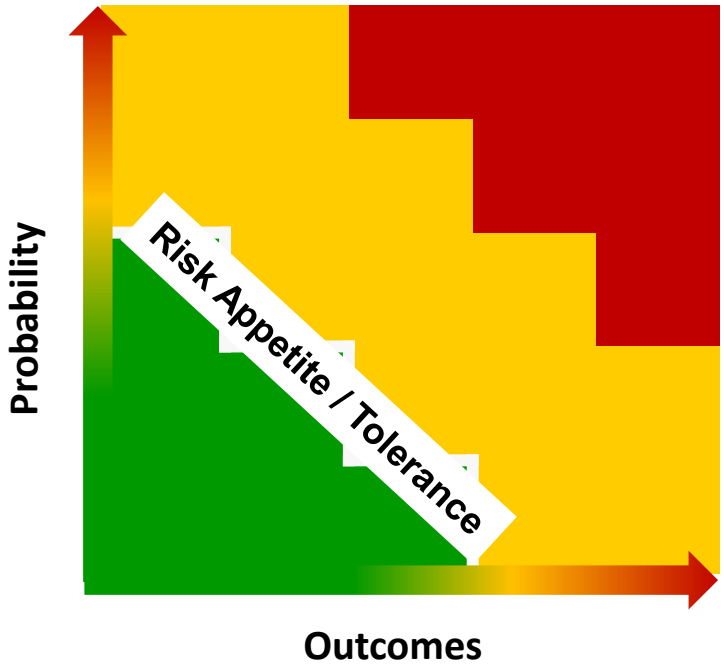
Context: Preventability



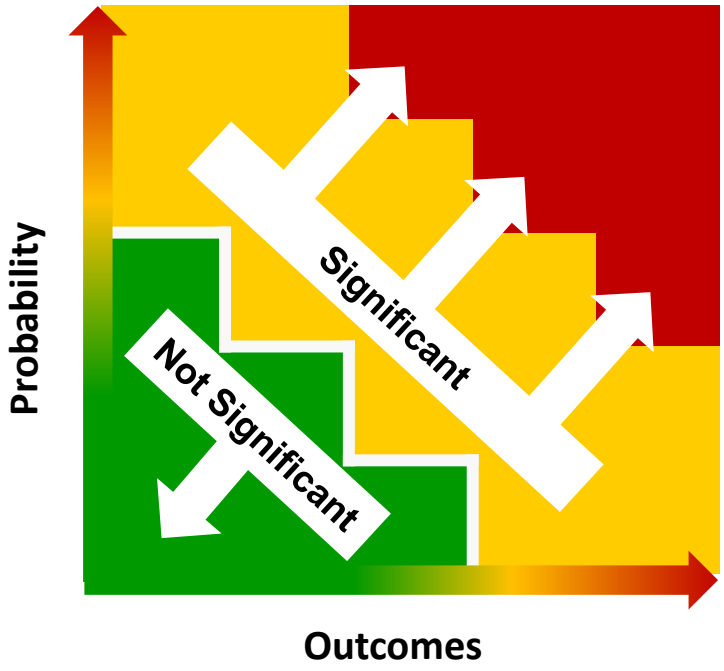
Determining Preventability



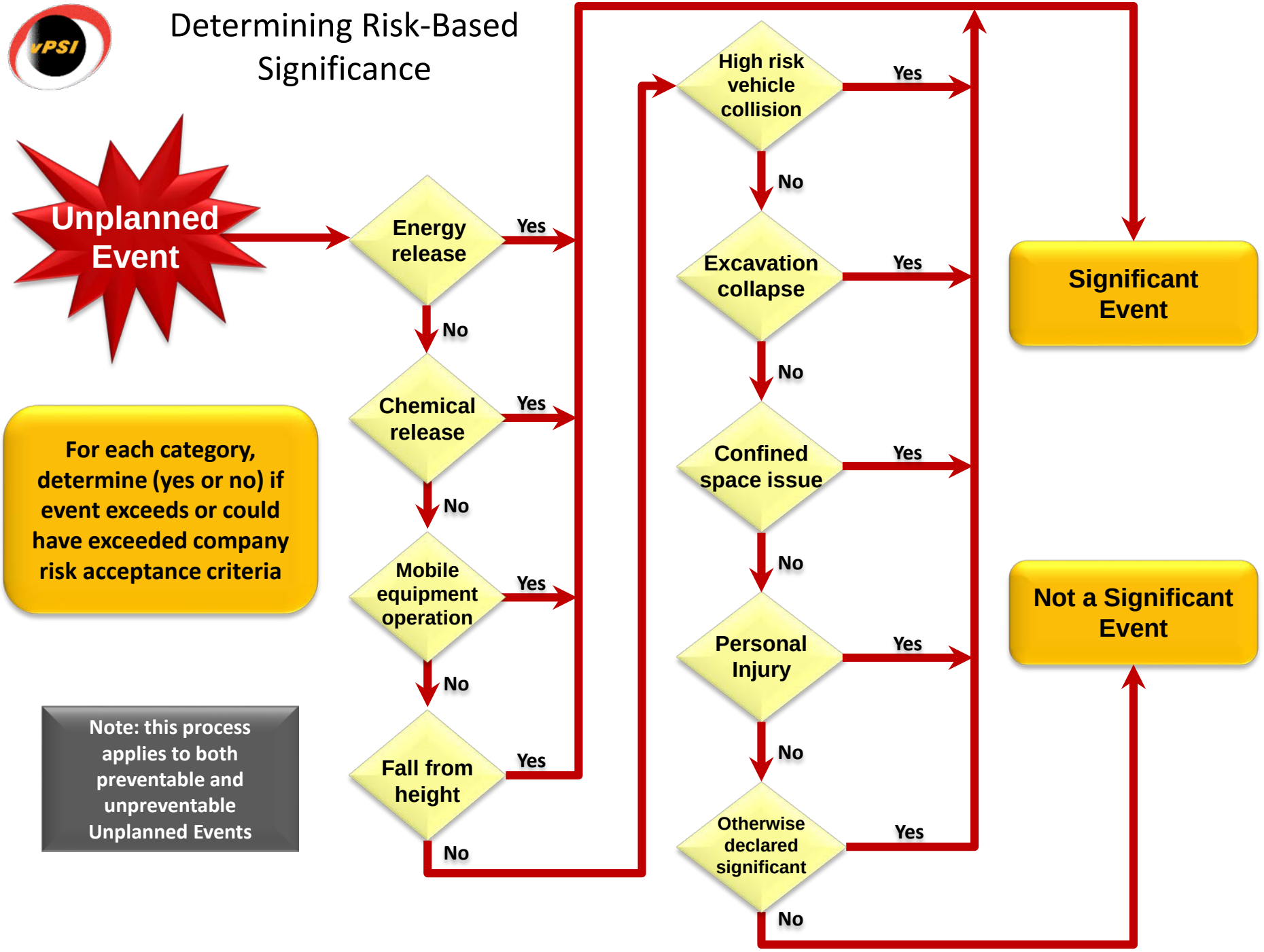
Context: Significance



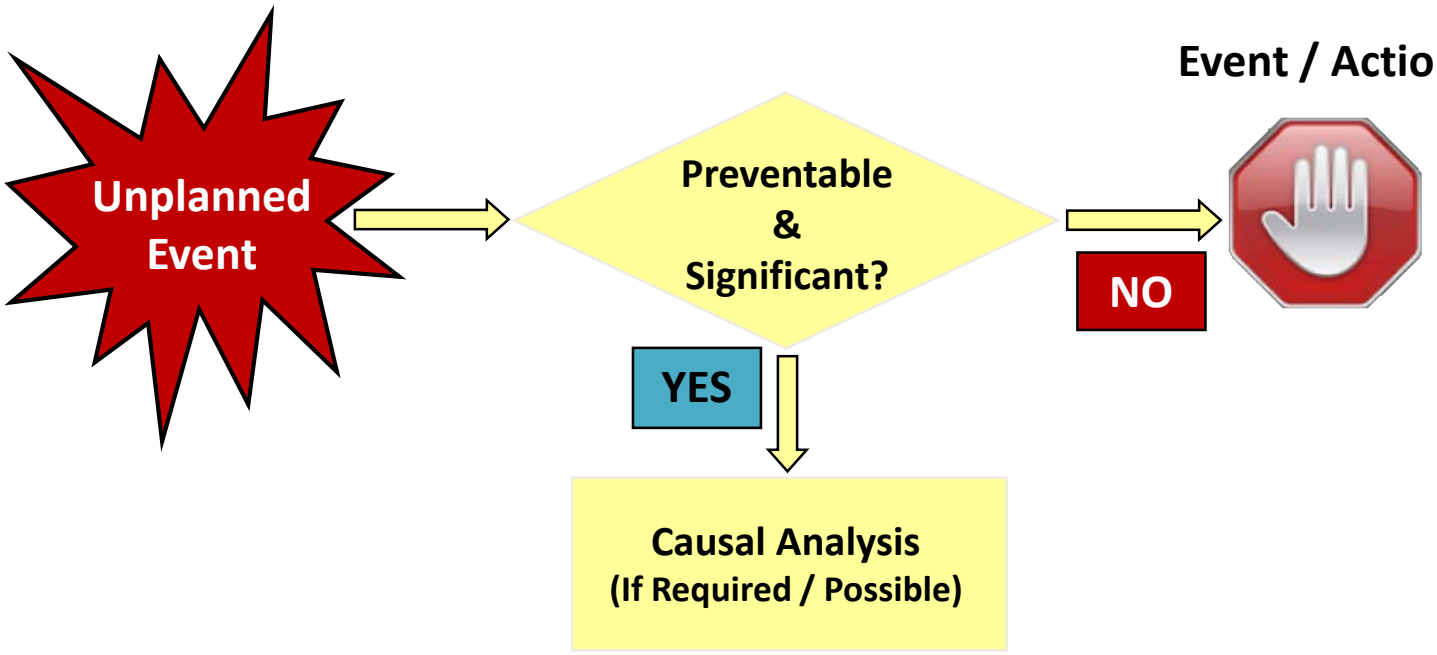
Context: Significance



Determining Risk-Based Significance



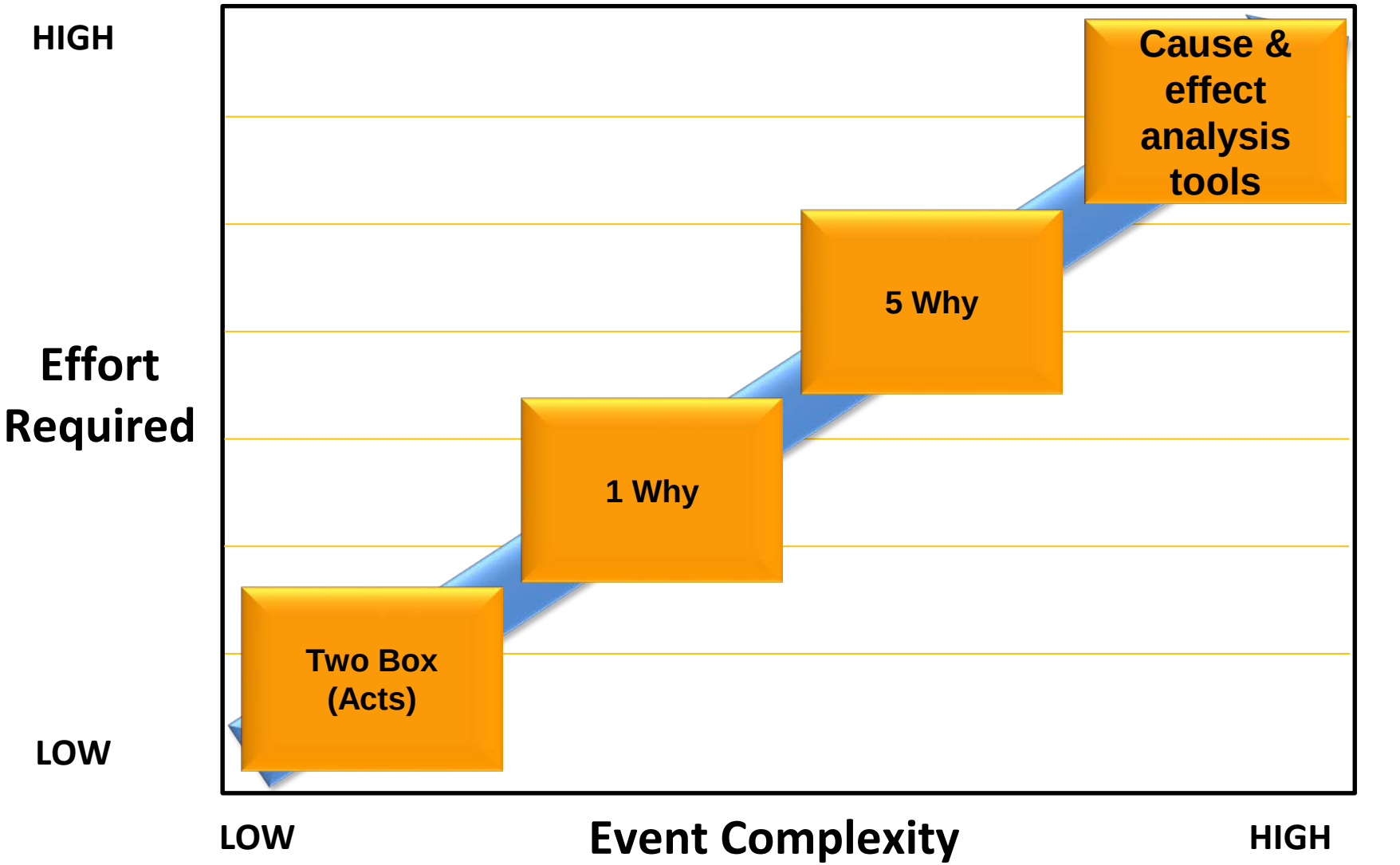
Event / Action Process Overview



Data Quality Ladder

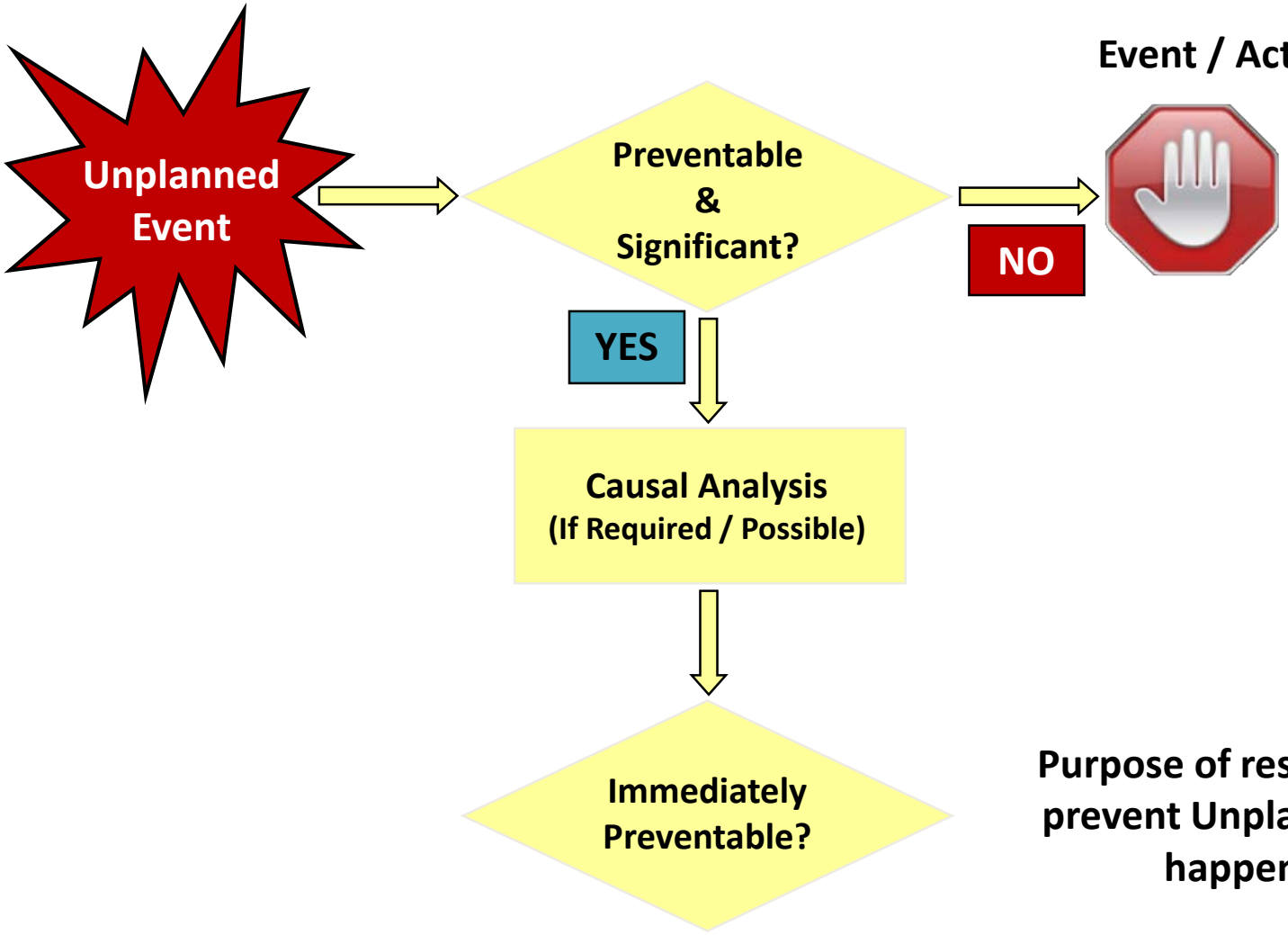
Fact	Precise, accurate, verifiable, measurable
Deduction	Logical inference
Assumption	Something taken for granted; a supposition
Opinion	May be based on gut feelings, experience
Belief	A strongly held conviction
Hearsay	Second-or-third hand information
Guess	May be "wild" or "educated" (WAGs or SWAGs)
Fantasy	No basis in reality

Resource Efficient Analysis



* C&E: Cause and Effect analysis

Event / Action Process Overview



Purpose of resource spend is to prevent Unplanned Event from happening again.

What is happening now?
Current Undesirable Acts of People

Related to Human Error?

- **Slip**
- **Lapse**
- **Mistake**
- **Violation**

Immediately Preventable?

Unplanned Event

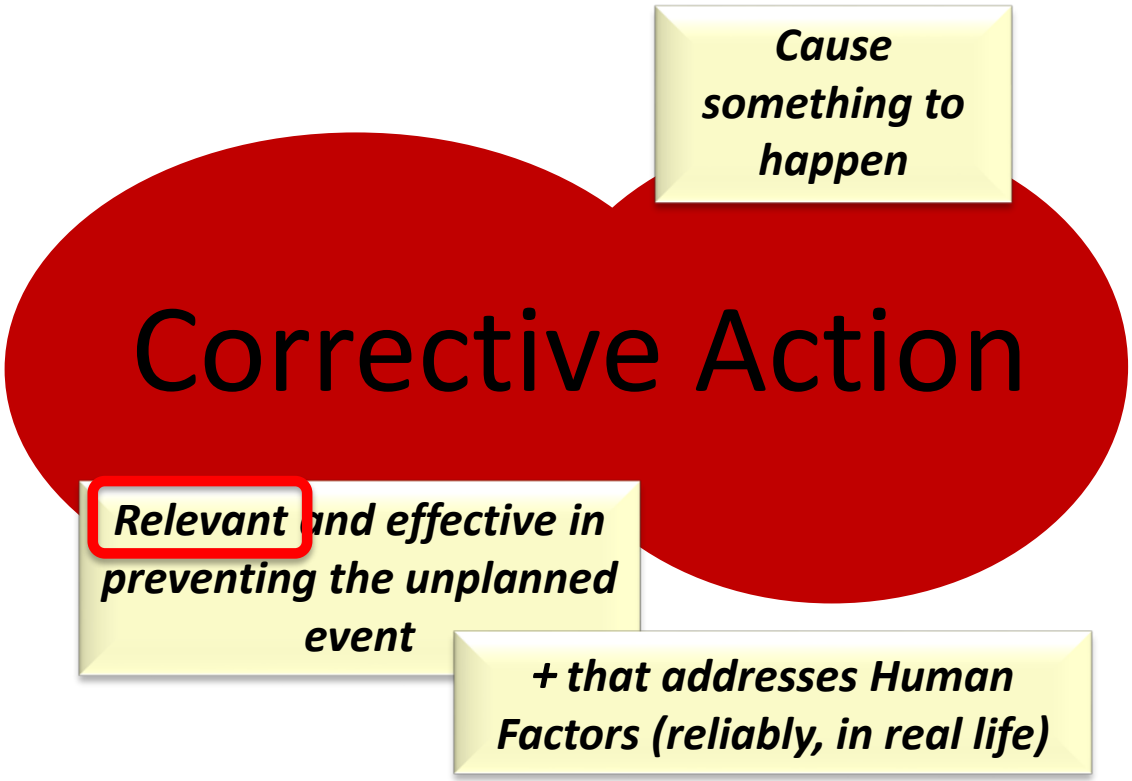
What is happening now?
Current Undesirable Acts of People

What will happen?
Desired Future Acts of People

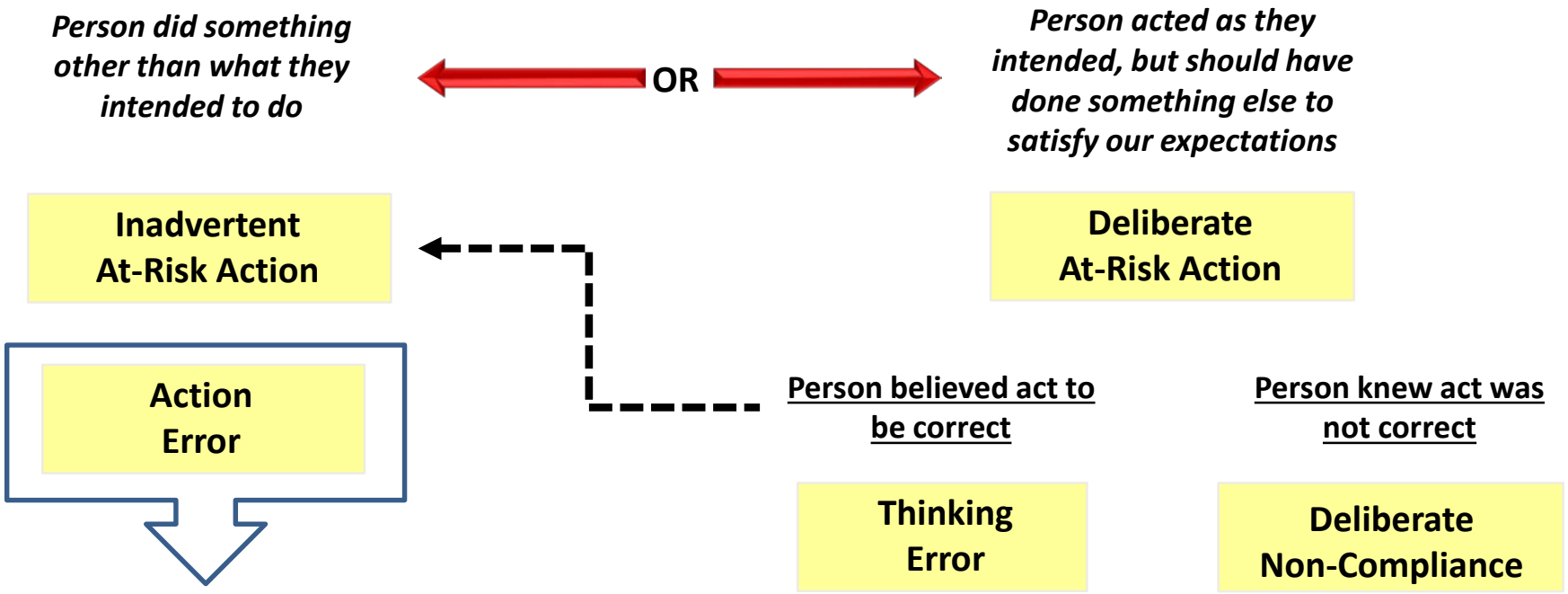
Implement an achievable Corrective Action that will result in this behavior change in the real world.

If no such action can be defined, Unplanned Event is not immediately preventable.

Validation of Corrective Actions



Example Human Failure Corrective Actions

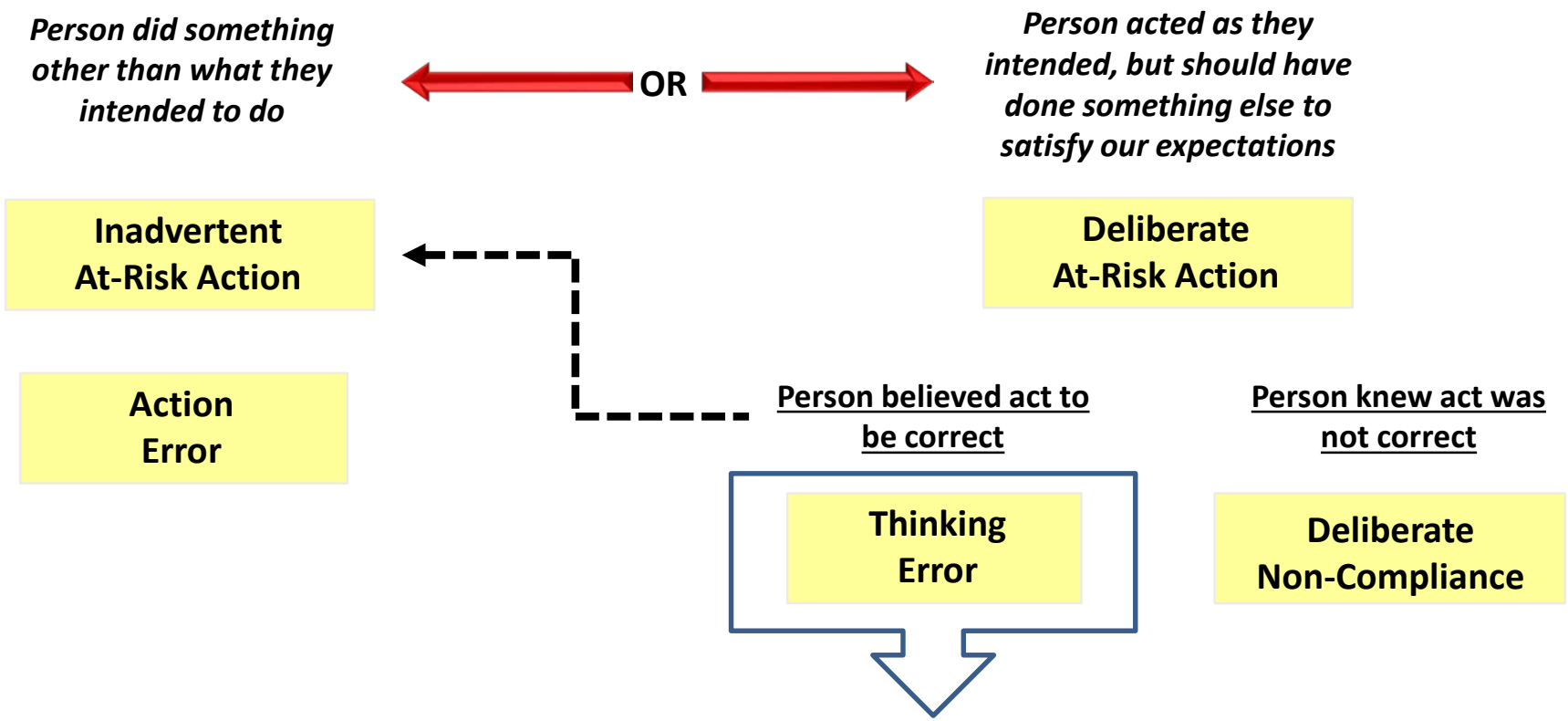


Difficult to eliminate completely.

- **Accept the risk / exposure.**
- **Workplace and/or task design to reduce probability of Action Error.**
- **Detect & neutralize: reduce probability of error escalating via independent verification of critical items.**
- **Make work process error tolerant.**

* Note these are only Corrective Actions when validated in context for a specific Unplanned Event

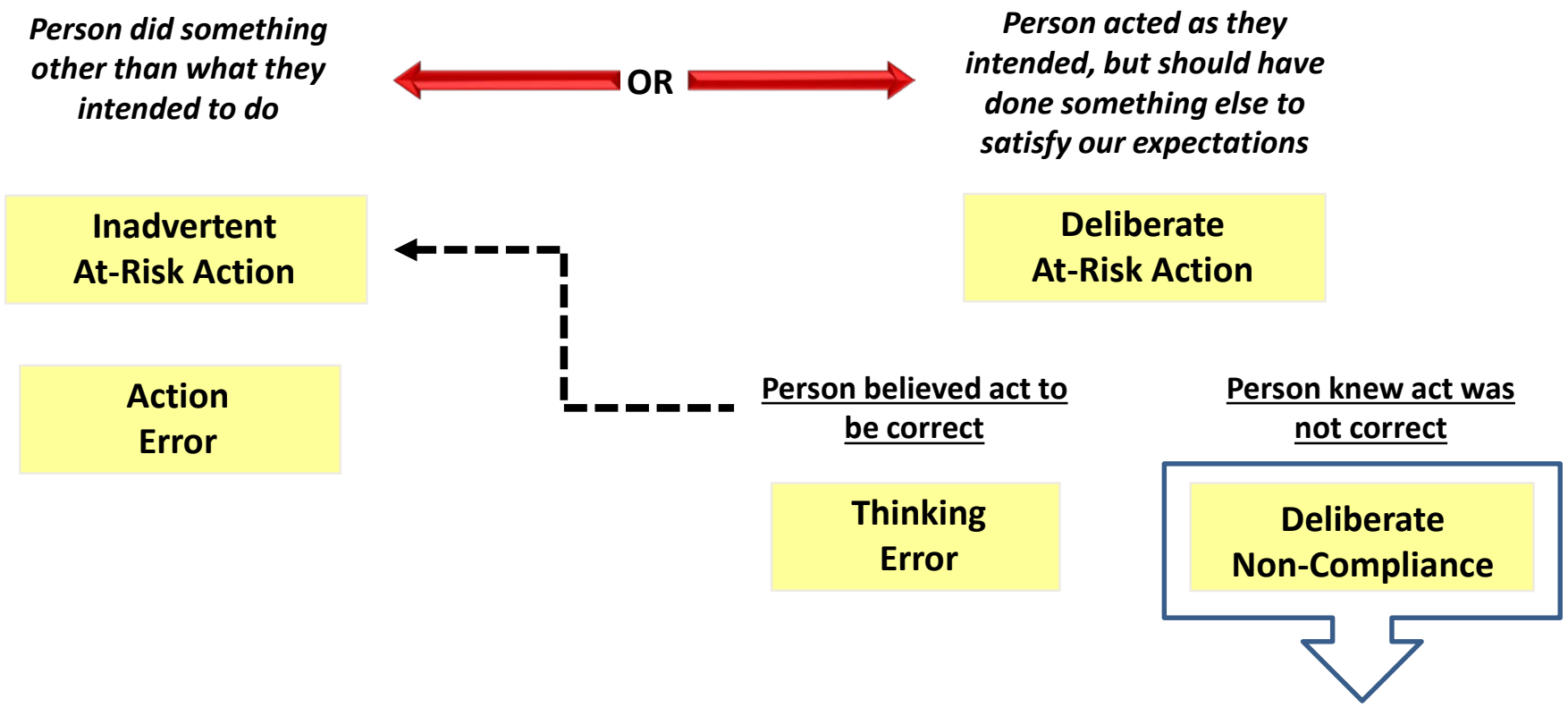
Example Human Failure Corrective Actions



- What if analysis generated scenario based training.
- Job / system specific competency training.
- Procedure revision.
- Improved system data delivery.
- Human Machine Interface (HMI) design.

* Note these are only Corrective Actions when validated in context for a specific Unplanned Event

Example Human Failure Corrective Actions



Must be relevant to Violation type (Routine, Enabled, etc)

- **Engaged supervision increasing reward probability for desired behaviors and negative outcomes for Violations.**
- **Modify work environment to eliminate forcing conditions.**
- **Eliminate unnecessary rules and bureaucracy.**

* Note these are only Corrective Actions when validated in context for a specific Unplanned Event

ABCs of Behavior

SIC / PICNIC

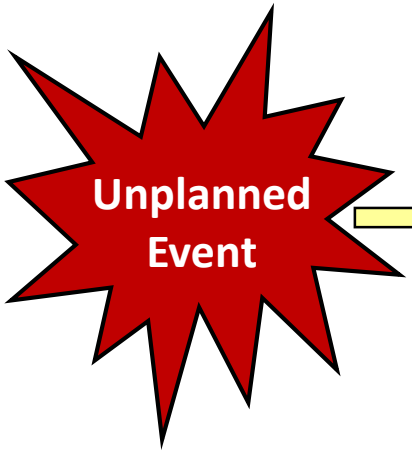
Feedback for a behavior must be:

- Significant
- Immediate
- Certain

- Positive
- Immediate
- Certain
- Negative
- Immediate
- Certain

Positive > Negative

Event / Action Process Overview



Preventable & Significant?

NO

YES

Causal Analysis (If Required / Possible)

Immediately Preventable?

NO

YES

Consequence Management

OR / AND

Long Lead Corrective Action

Preventive / Corrective Action

Potentially problematic wrt Human Failure issues

Actions You Can Take Right Now

- **Gap / Opportunity Analysis of current processes from Human Factors / Human Failure perspective**
- **Implement significance and preventability filters**
- **Facilitate HAZOP-like HF reviews**
- **Develop and train onsite Data / Evidence Gathering Protocol to allow incorporation of HF in incident investigation process**
- **Train personnel in resource efficient and effective analysis of HF issues**
- **Train personnel in development of efficient and effective corrective actions against HF issues**
- **Measure the effectiveness of the organization's response to Unplanned Events, including those involving HF**

* Note "Train" in this context means impart and maintain competence

Pragmatic Inclusion of Human Factors In Incident Investigation

Questions?

Norman Ritchie, vPSI Group, LLC

Houston, Texas

nritchie@vpsigroup.com