

High Reliability Organizations Past and Future

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Rev c

Testing the Waters

- Are you **COMFORTABLE** with your ability to foresee problems in your operations?
- Are you **SENSITIVE** to the possibility of failure?
- Can you recover from a catastrophic event?
- How do you know?
- Can you benefit from High Reliability?

Weak Signals

What is a High Reliability Organization?

- An organization that repeatedly accomplishes its high hazard mission while avoiding catastrophic events, despite significant hazards, dynamic tasks, time constraints, and complex technologies
- A key attribute of being an HRO is to learn from the organization's mistakes
 - Aka a learning organization



Business Case for High Reliability

Why is being High Reliability so Important?



Why Is Being an HRO So Important?

Some types of system failures are so punishing that they must be avoided at almost any cost.

These classes of events are seen as so harmful that they disable the organization, radically limiting its capacity to pursue its goal, and could lead to its own destruction.

Laporte and Consolini, 1991

Why Is Being an HRO So Important?

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Motivation to Become an HRO

- The U.S. Nuclear Deterrent is Essential
 - Deters threats from weapons of mass destruction
 - Assures our allies of their security
 - Dissuades potential adversaries from threatening U.S. interests
 - Defeats potential adversaries if not deterred
- Value of U.S. Nuclear Deterrent isn't the number of warheads but the credibility of our capabilities in the minds of those we seek to deter, dissuade, or assure
- To achieve its psychological and political objectives, deterrence requires nuclear capabilities to be visible and credible
- The DOD delivers the U.S. Nuclear Deterrent
- The DOE provides the weapons and the support infrastructure
 - The DOE is a essential component of the U.S. Nuclear Deterrent!

The Alternate to the HRO

Have Good Safety Statistics?



Feeling Comfortable with a Good TRC?

- As Columbia and Davis-Besse have demonstrated, great safety stats don't equal real, tangible *organizational* safety.
- The tendency for normal people when confronted with a continuous series of positive “stats” is to become comfortable with good news and not be sensitive to the possibility of failure.
- “Normal people” routinely experience failure by believing their own press (or statistics).

NASA & Columbia

Jan 16, 2003

- When NASA lost 7 astronauts, the organization's TRC rate was **600%** better than the DOE complex.
- And yet, on launch day
 - 3,233 Criticality 1/1R* hazards had been waived.

* Criticality 1/1R component failures result in loss of the orbiter and crew.

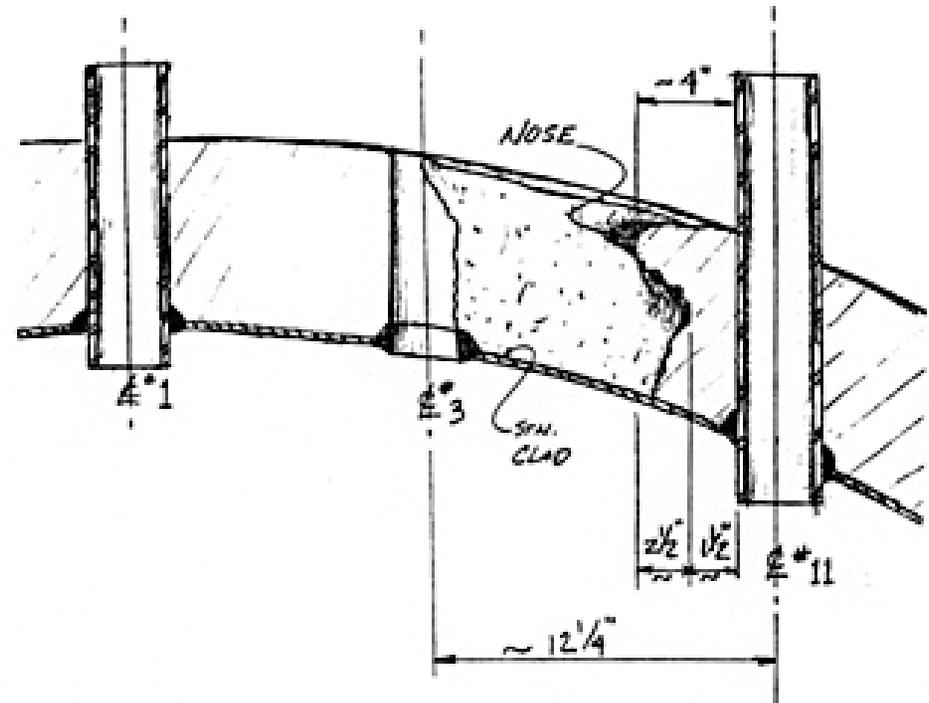


- **CAIB:** “The unexpected became the expected, which became the accepted.”

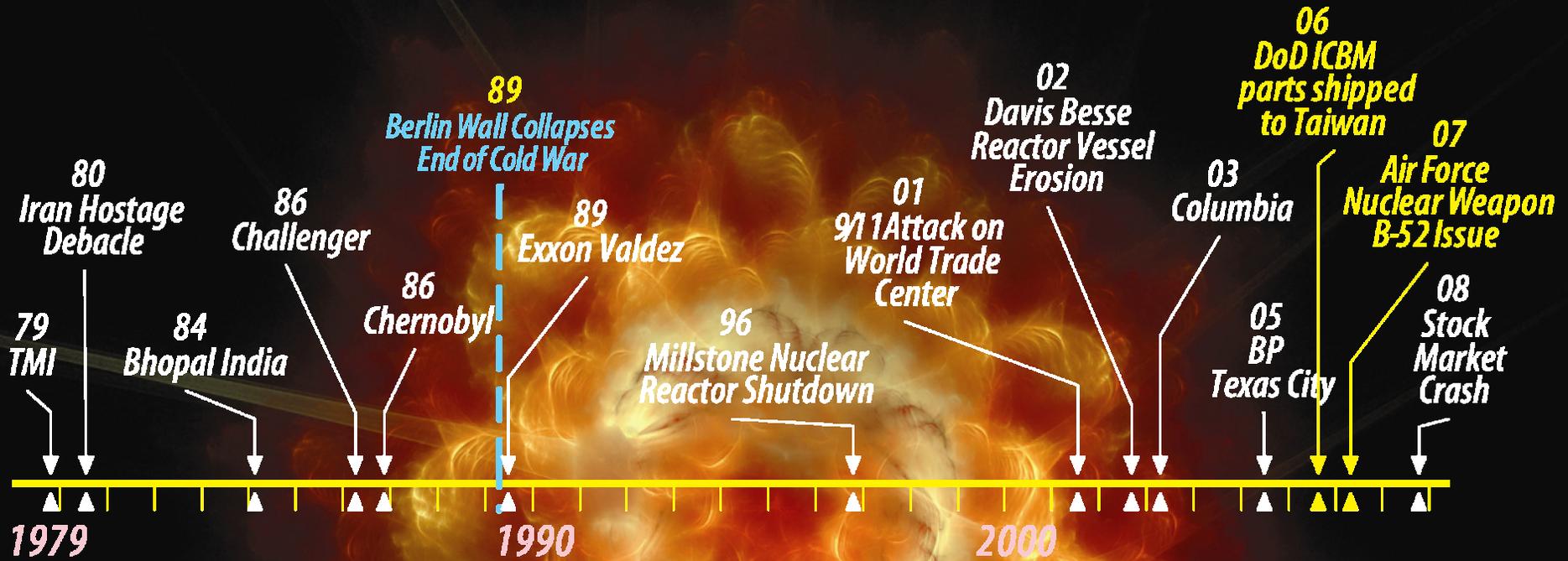
Davis-Besse

2002

- Had some performance “hard spots” in the 80's
- Had become a world-class performer in the next 15 years
 - Preceding initiating events of mid 90's
- Frequently benchmarked by other organizations
 - While a serious corrosion event was taking place
 - Complete core melt near miss in 2002



SYSTEM ACCIDENT TIMELINE



Who is Next?

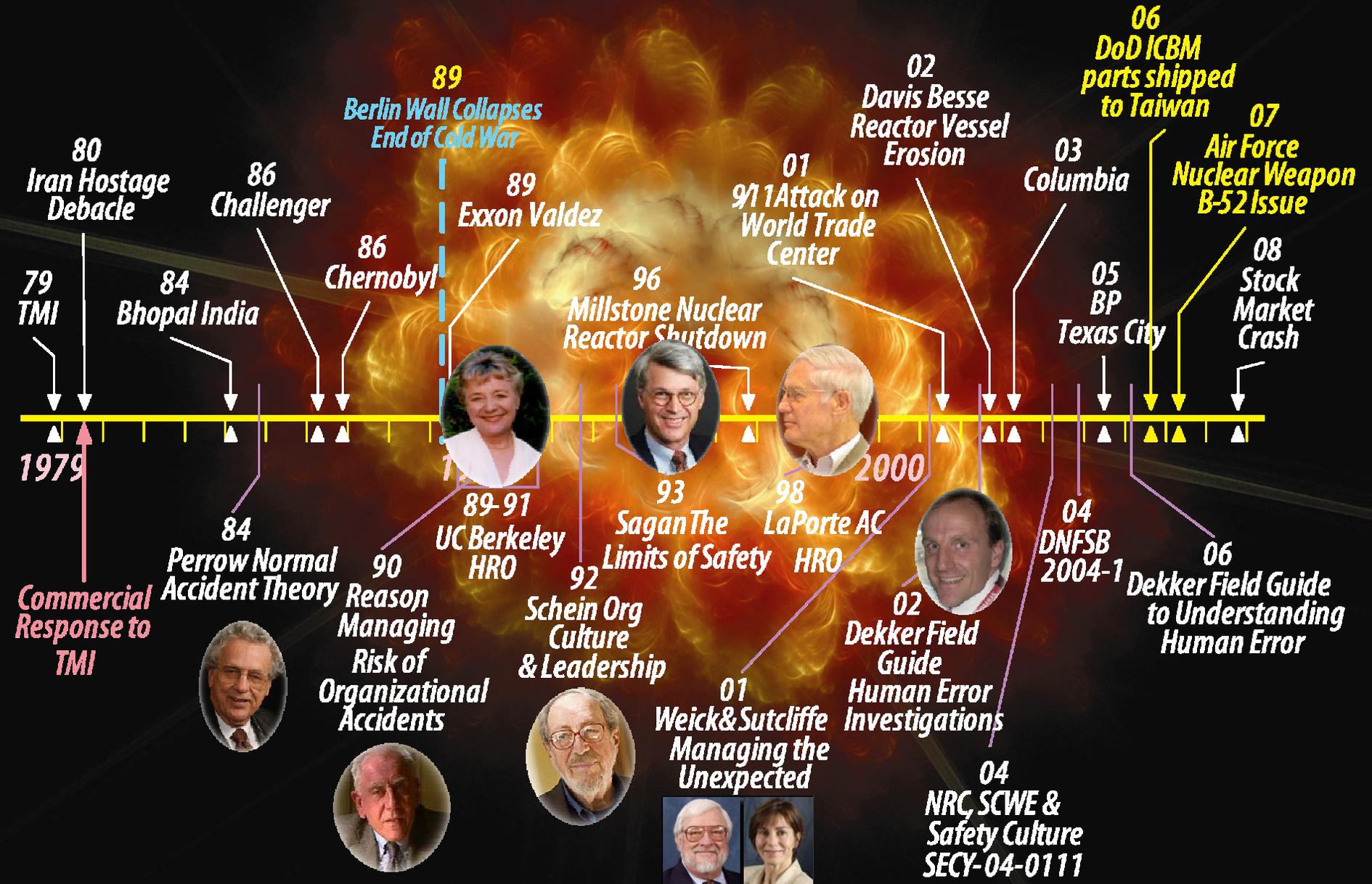
How do Organizations Get Themselves into System Accident Space?

Failure to Manage Risk?



Attempts to Prevent to System Accidents

(Introduction of High Reliability and Normal Accident Theory)



High Risk or High Consequence?

$$R = C \times P$$

Risk = Consequence x Probability

If we are truly working with high-risk operations, ethically and morally we should not be in business!



High Reliability Organization (HRO) vs. Normal Accident Theory (NAT)



Dr. Karlene Roberts

Belief of HRO

Accidents can be avoided by
organizational design and management
i.e. Risk = C x P is manageable

Belief of NAT

Accidents are inevitable in
complex and tightly coupled operations
i.e. Risk = C x P is too high



Dr. Charles Perrow

High Reliability Organization (HRO) vs. Normal Accident Theory (NAT)

Belief of HRO

Accidents can be avoided by

organizational design and management

i.e. Risk = C x P is manageable

Control of Risk

DOE reduces “C” by:

- minimizing the hazard and/or
- mitigating the consequence

DOE reduces “P” - human performance improvement

- human performance error precursors
- barriers

High Reliability or Accident Waiting to Happen?

HRO

*Accidents can be avoided by
organizational design and management*

HROs use the rational-closed system construct to accomplish their goal by:

1. Maintaining safety as a leadership objective
2. Using redundant systems
3. Focusing on three operational and management factors
 - decentralization,
 - culture, and
 - continuity
4. Being a learning organization



Dr. Scott Sagan

The Limits of Safety, Scott Sagan

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Without leadership, safety is but a façade.

Multiple & Independent Barriers

Workers have to call the shots.
Leaders want workers to call the shots as they would.

Want workers to call the shots based on experience – keep the plant open.

Learn from small mistakes – information-rich events!

High Reliability or Accident Waiting to Happen?

Pressure to maintain production only slightly modified by increased interests in safety.

Redundancy makes system opaque.
Redundancy falsely makes system appear more safe.

Leaders don't know enough about their operations to evaluate whether workers are responding correctly or not.

Causes of accidents and near-misses unclear –hard to learn.
Incentives to fabricate positive records abound.

NAT

Accidents are inevitable in tightly coupled and complex operations.

NATs believe the natural-open organizational system prevails because:

1. Conflicting leadership objective prevail
2. There are perils in redundant systems
3. There is no effective management of
 - decentralization,
 - culture, or
 - continuity
4. Organizational learning is restricted

The Limits of Safety, Scott Sagan

High Reliability or Accident Waiting to Happen?

Attributes of HROs and NATs

HRO

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Good

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Bad

The Limits of Safety, Scott Sagan

High Reliability or Accident Waiting to Happen?

Attributes of HROs and NATs

HRO

NAT

Accidents can be avoided by
organizational design and management

Accidents are inevitable in
tightly coupled and complex operations.

**These are attributes of
HROs and NATs.**

**The literature is silent on how
they are achieved or avoided.**

Good

Bad

The Limits of Safety, Scott Sagan

High Reliability or Accident Waiting to Happen?

- How could any organization be so callous as to ignore the signs of Normal Accidents which could result in catastrophic results?
- There is a clear mandate to avoid the catastrophic event, why do they let the unexpected occur?

How can they let the unexpected become the expected, which could become the accepted?

Mis-Managing the Unexpected

- The unexpected doesn't take the form of a major crisis.
- It's triggered by a deceptively simple sequence in organizational life:
 - A person or unit has an intention, takes action, misunderstands the world
 - Actual events fail to coincide with the intended sequence
 - There is an unexpected outcome.



Dr. Karl Weick



Dr. Kathleen Sutcliffe

Managing the Unexpected, Karl E. Weick & Kathleen M. Sutcliffe

Mis-Managing the Unexpected (cont.)

- People dislike unexpected outcomes and surprises.
 - Search for confirmation of expectations:
 - Generous in what we treat as evidence
 - Avoid disconfirming evidence
 - Result:
 - Overlook accumulated evidence
 - Tendencies become stronger the more behind we get
- This normal reaction makes situations worse.



Managing the Unexpected, Karl E. Weick & Kathleen M. Sutcliffe



Managing the Unexpected

LESSON:

Good management of the unexpected is **MINDFUL** management of the unexpected.

- Mindful - High Reliability Organizations rarely fail even though they encounter numerous, unexpected events.



Managing the Unexpected, Karl E. Weick & Kathleen M. Sutcliffe



Mindful Management of the Unexpected

- Anticipate the unexpected
 - Preoccupied with failure
 - Reluctant to simplify
 - Sensitive to operations
- Contain the unexpected
 - Committed to resilience
 - Deference to expertise



Key Difference: HRO's vs. "Normal"

- Responds to "unexpected" in the earliest stages
 - When "unexpected" gives off only **WEAK** signals
- Mindful Management preserves capability to:
 - See the significant meaning of weak signals
 - Give strong response to those weak signals



Managing the Unexpected, Karl E. Weick & Kathleen M. Sutcliffe

Weak Signals

“Sometimes when I consider what tremendous consequences come from little things ... I am tempted to think there are no little things.”

Bruce Barton

What “weak signals” have you seen your organization lately?



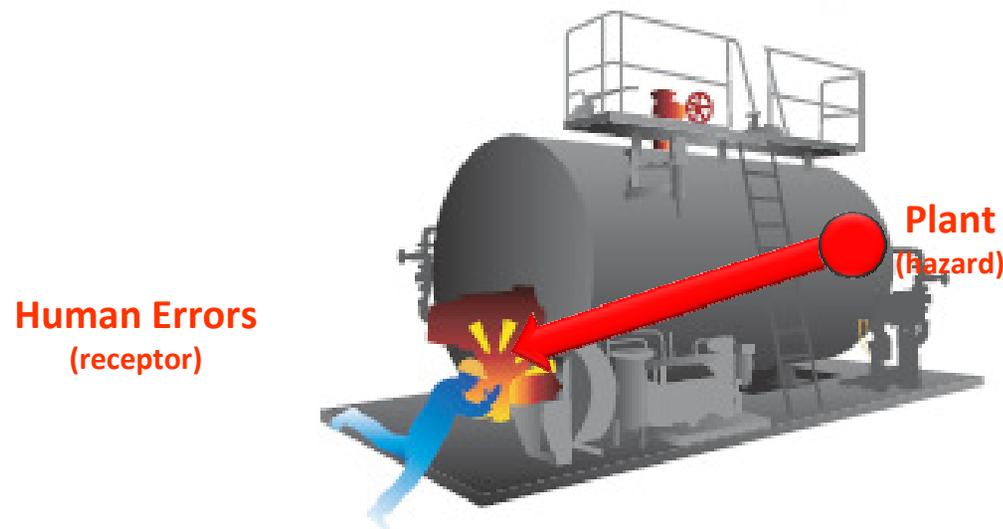
What is the Focus of an HRO?

Individual Accidents OR Systems Accidents?



Individual Accident

- An accident occurs wherein the worker is not protected from the plant and is injured (e.g. radiation exposure, trips, slips, falls, industrial accident, etc.)



Focus:
Protect the worker from the plant

Systems Accident

- An accident wherein the system fails allowing a threat (human errors) to release hazard and as a result **many** people are adversely affected
 - Workers, Enterprise, Surrounding Community, Country

Human Errors
(threat)



Focus:

Protect the
plant from
the worker

The emphasis on the system accident in no way degrades the importance of individual safety , it is a pre-requisite of an HRO

Strive To Avoid A Systems Accident!

- Goal of a High Reliability Organization
 - Strive daily for High Reliability Operations
- A systems approach
 - Every individual is not going to have a perfect day every day
 - To avoid the catastrophic accident a systems approach is required



Building a High Reliability Organization



Goal of an HRO

*The most important thing,
is to keep the most important thing,
the most important thing.*

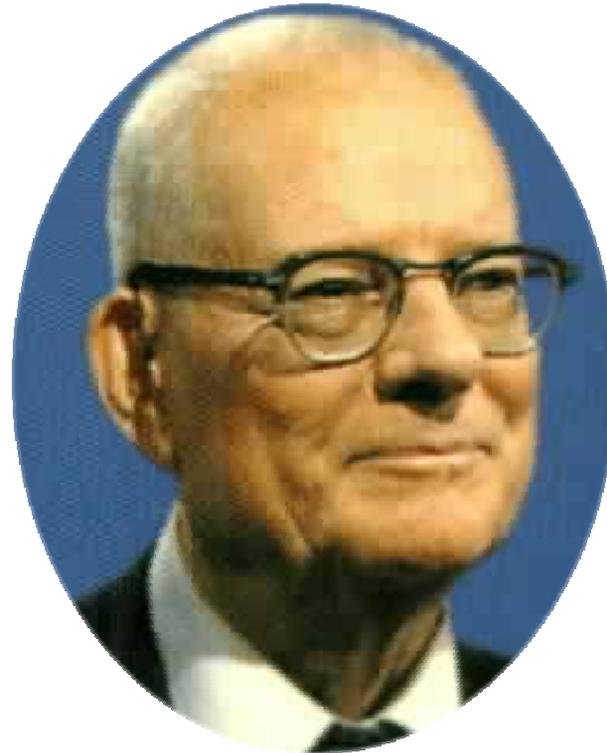
Steven Covey, 8th Habit

- Focus on what is important
- Measure what is important

Construct of the HRO

Systems Approach to Avoid Catastrophic Accidents

Deming's Theory of Profound Knowledge (TPK) provides a foundation for the systems approach



W. Edwards Deming

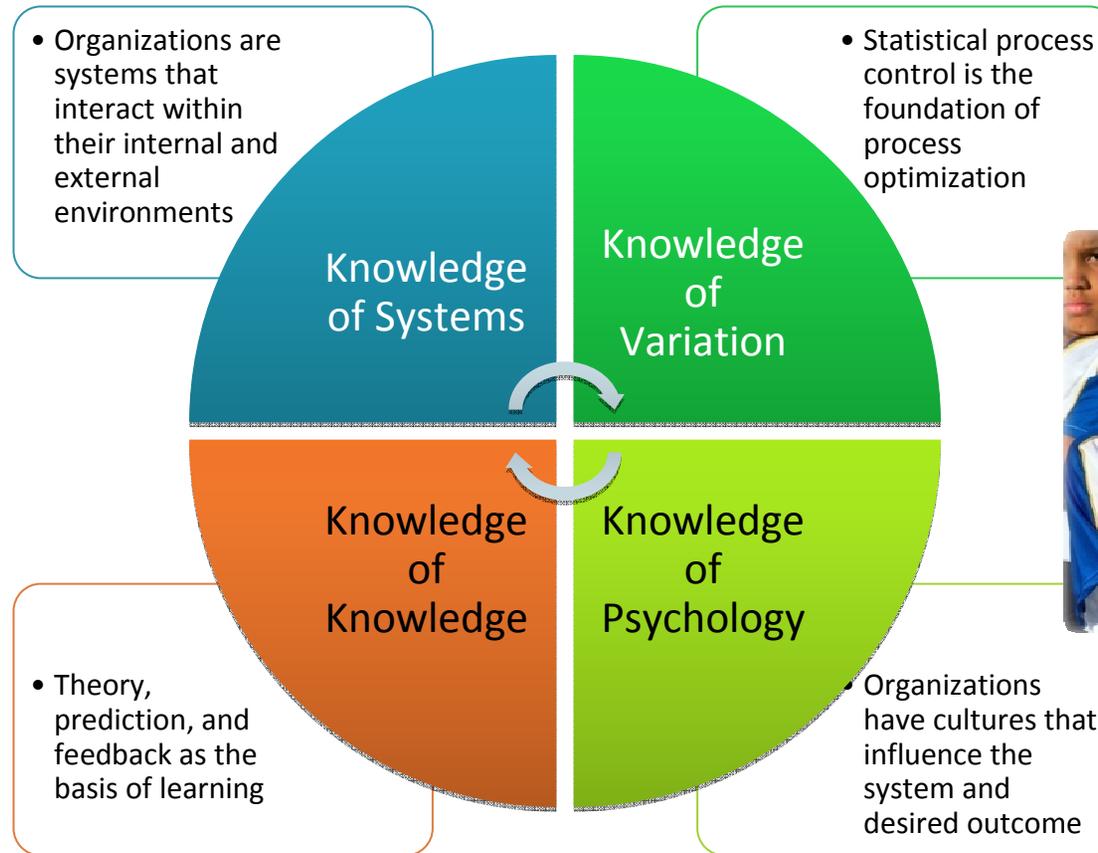
We used Deming's Theory of Profound Knowledge to develop a process to attain those HRO attributes identified by the High Reliability Theorists



Construct of the HRO

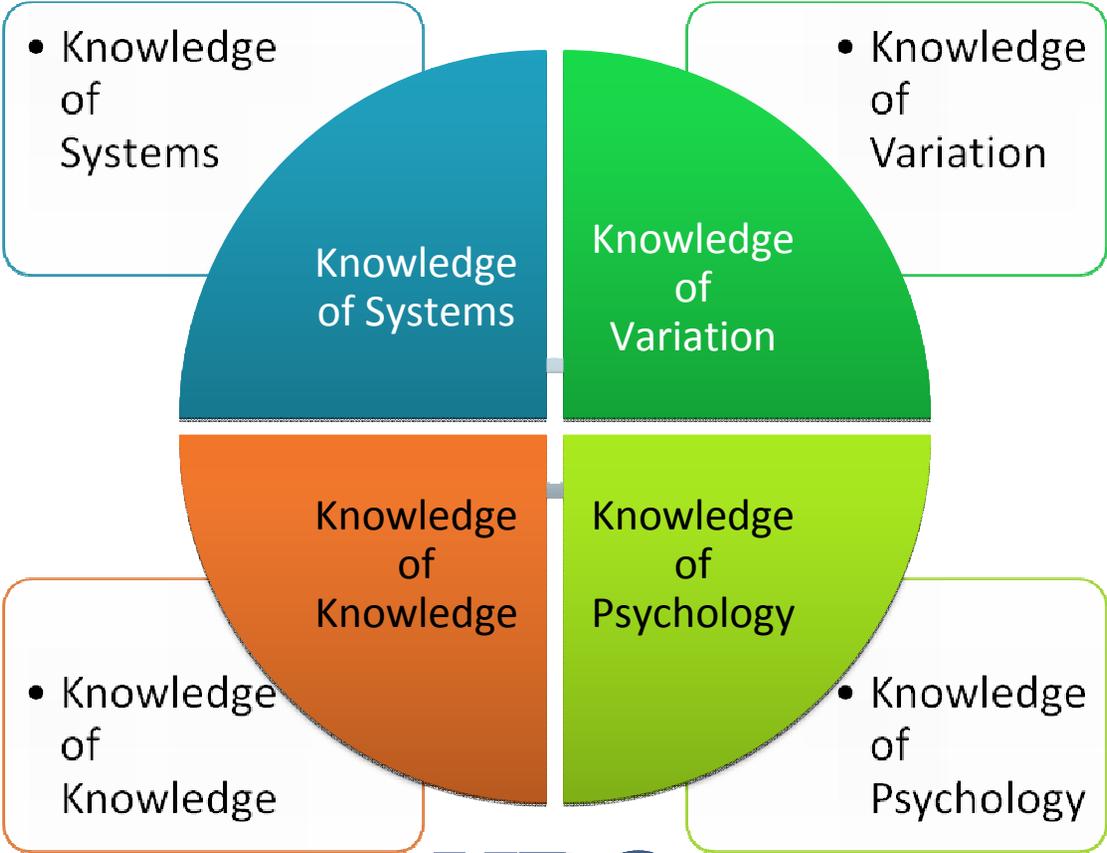
Systems Approach to Avoid Catastrophic Accidents

Deming's Theory of Profound Knowledge (TPK) used to provide foundation for the systems approach



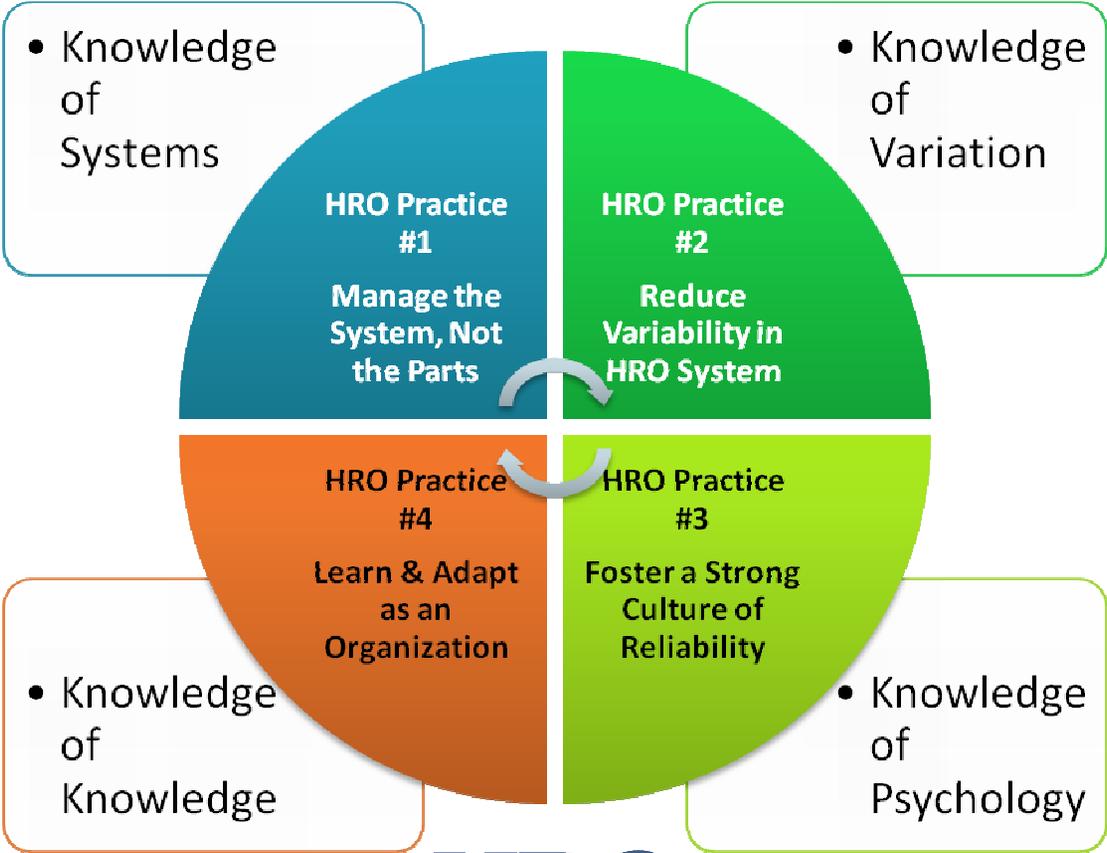
Fundamental HRO Practices

Use a Systems Approach to Avoid Catastrophic Accidents



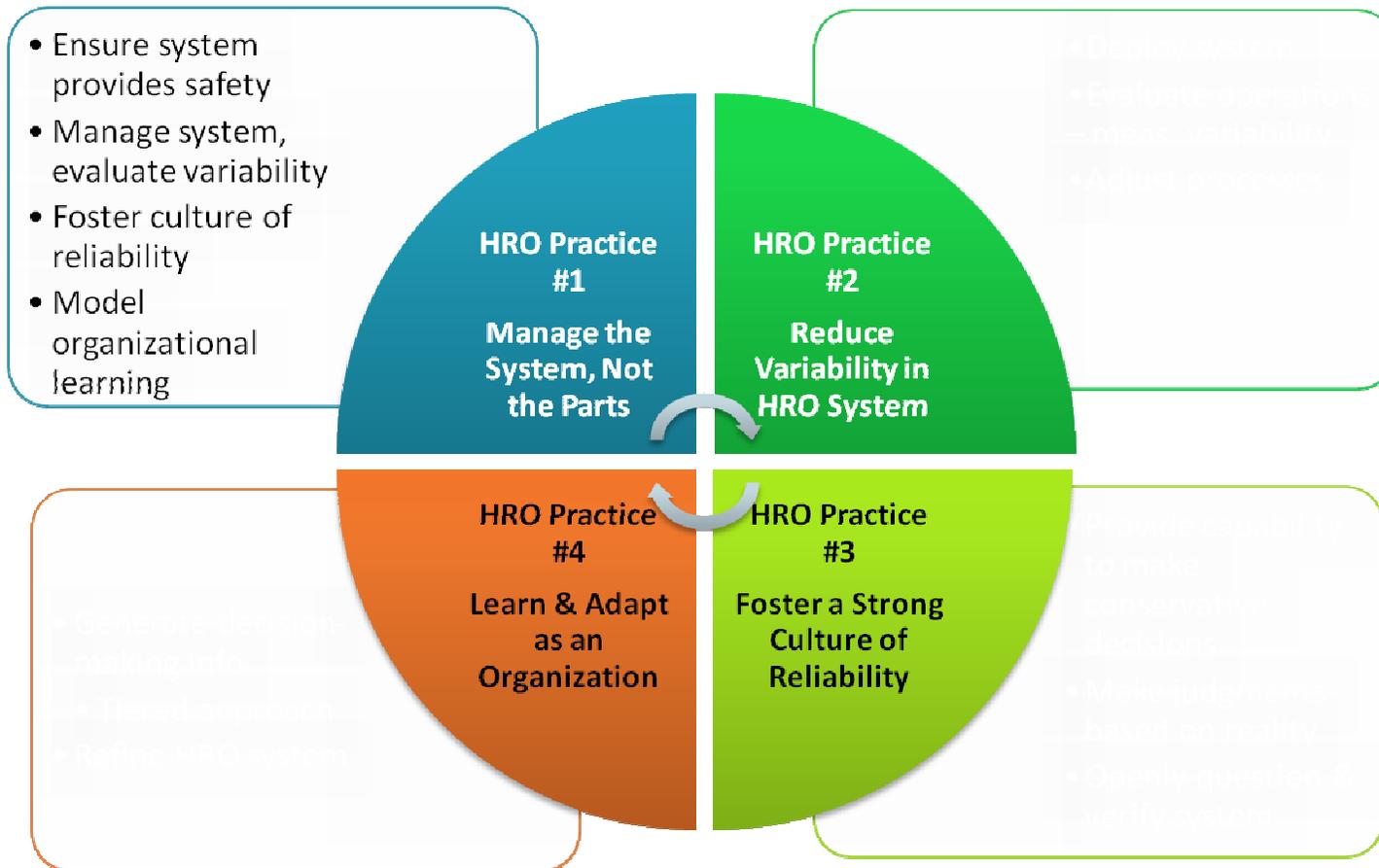
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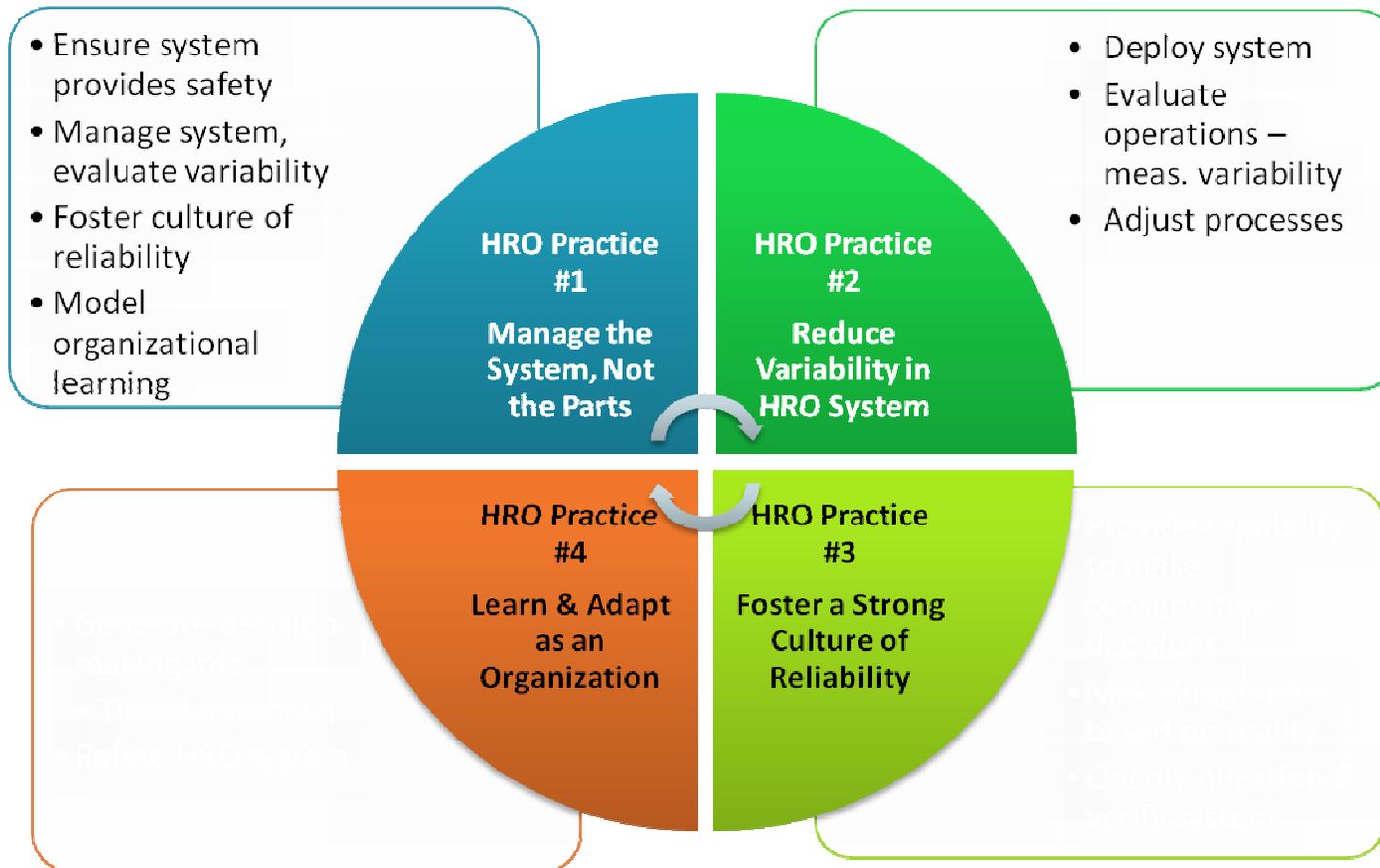
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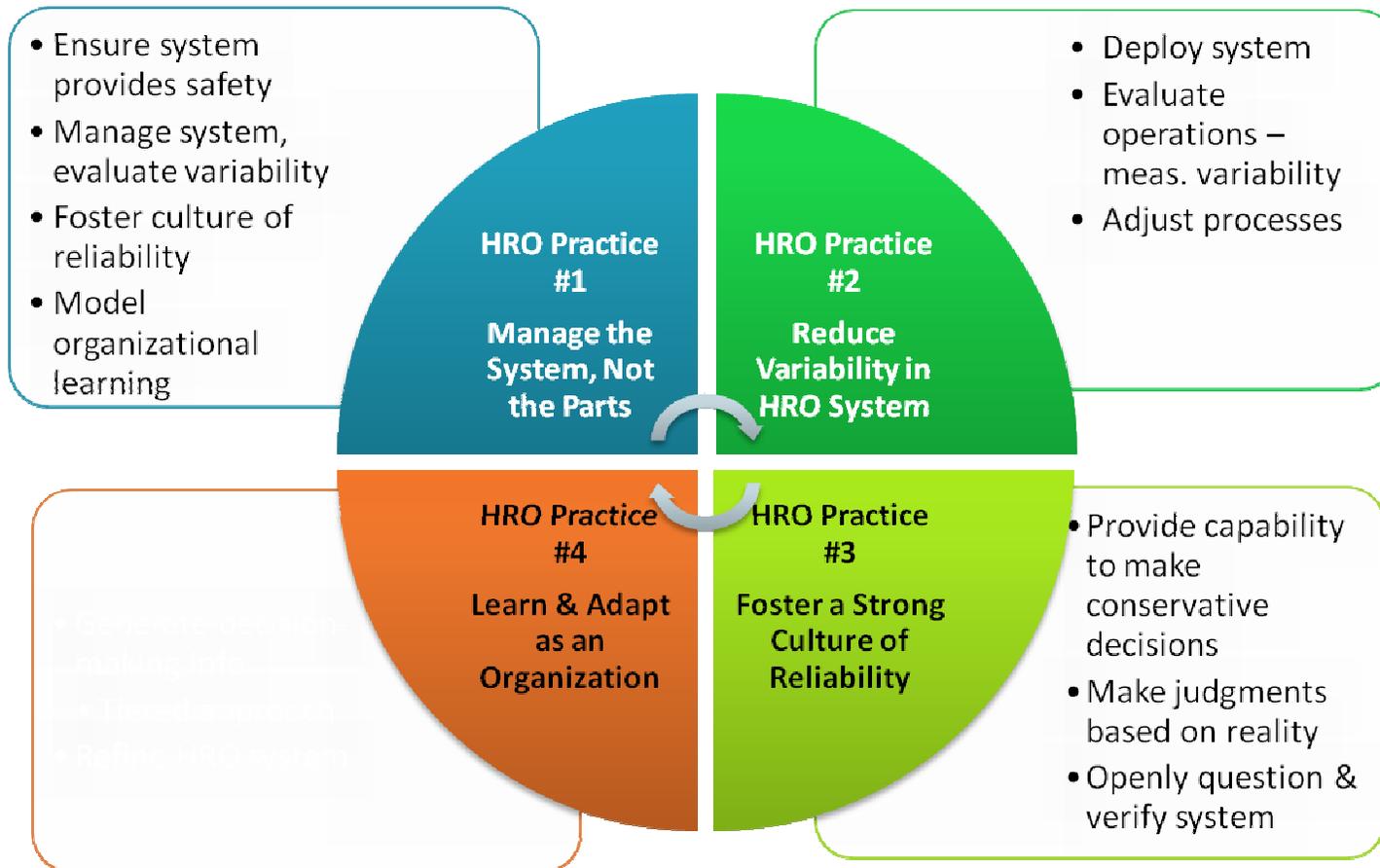
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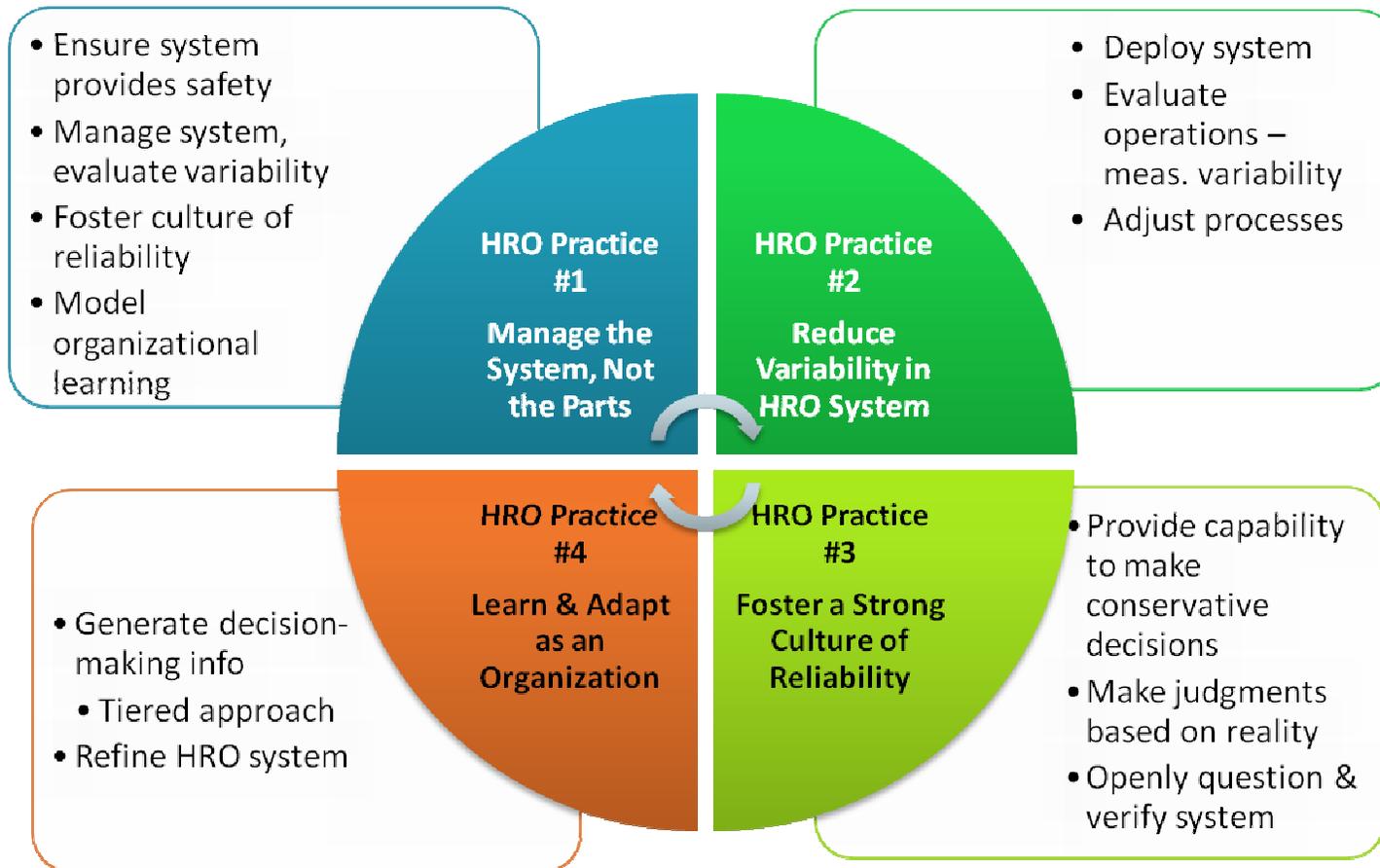
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Fundamental HRO Practices

Use a Systems Approach to Avoid Catastrophic Accidents





Evaluating the High Reliability Organization

How Good are You Doing in Attaining and Sustaining a Culture of Reliability?



What does Culture to for You?

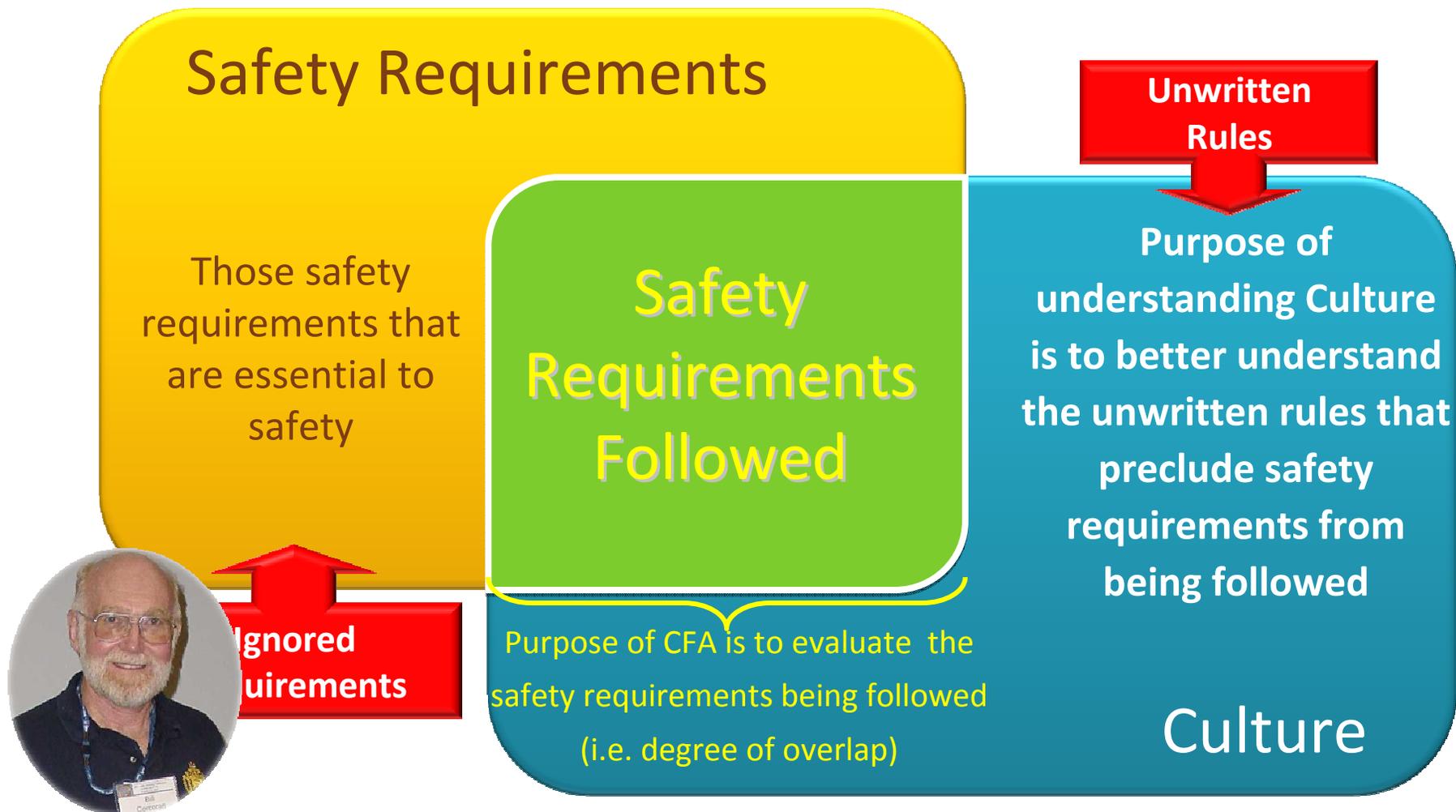
Organization's Culture Provides

1. Sustainability for the HRO

or

2. Inhibitors to being an HRO

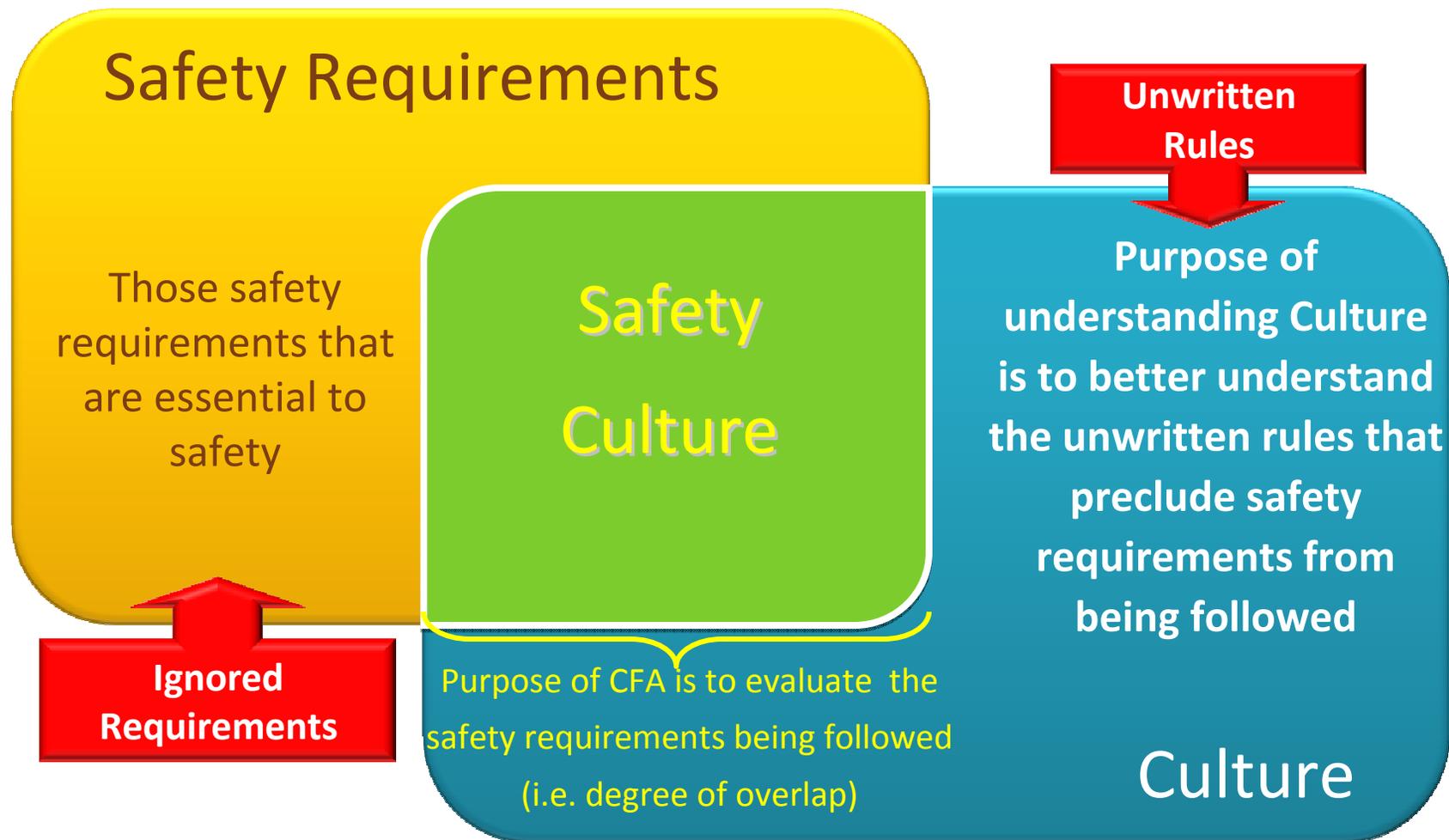
Why Culture is Important to an HRO



Dr. Bill Corcoran

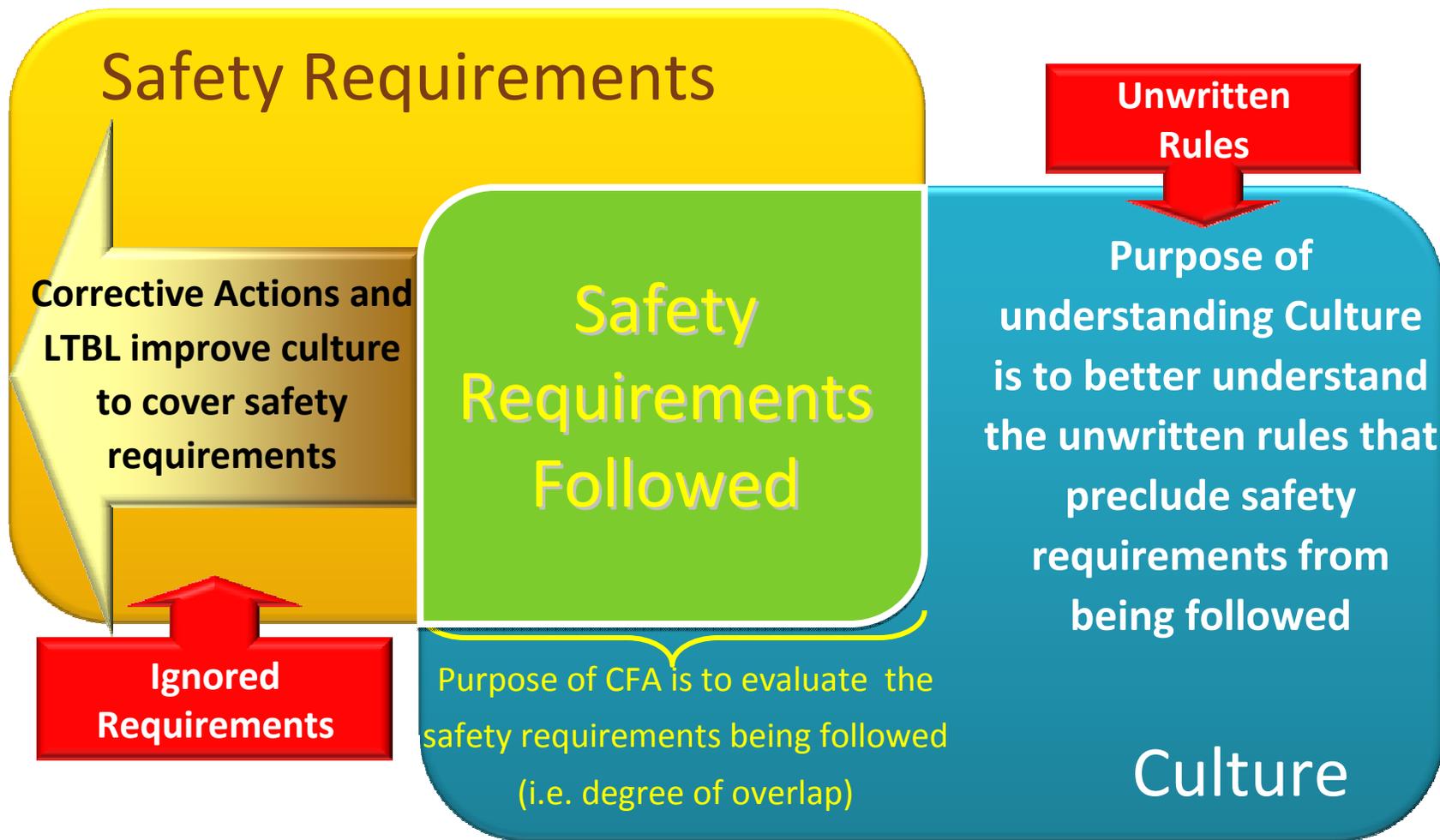
Modified from W. R. Corcoran, NSRC Corporation

Why Culture is Important to an HRO



Modified from W. R. Corcoran, NSRC Corporation

Why Improving Culture is Essential to an HRO



Modified from W. R. Corcoran, NSRC Corporation

Levels of Organizational Culture



Dr. Edgar Schein

What You Do

Artifacts and Behaviors

What You Say
You're Going
To Do

Espoused Values and Beliefs

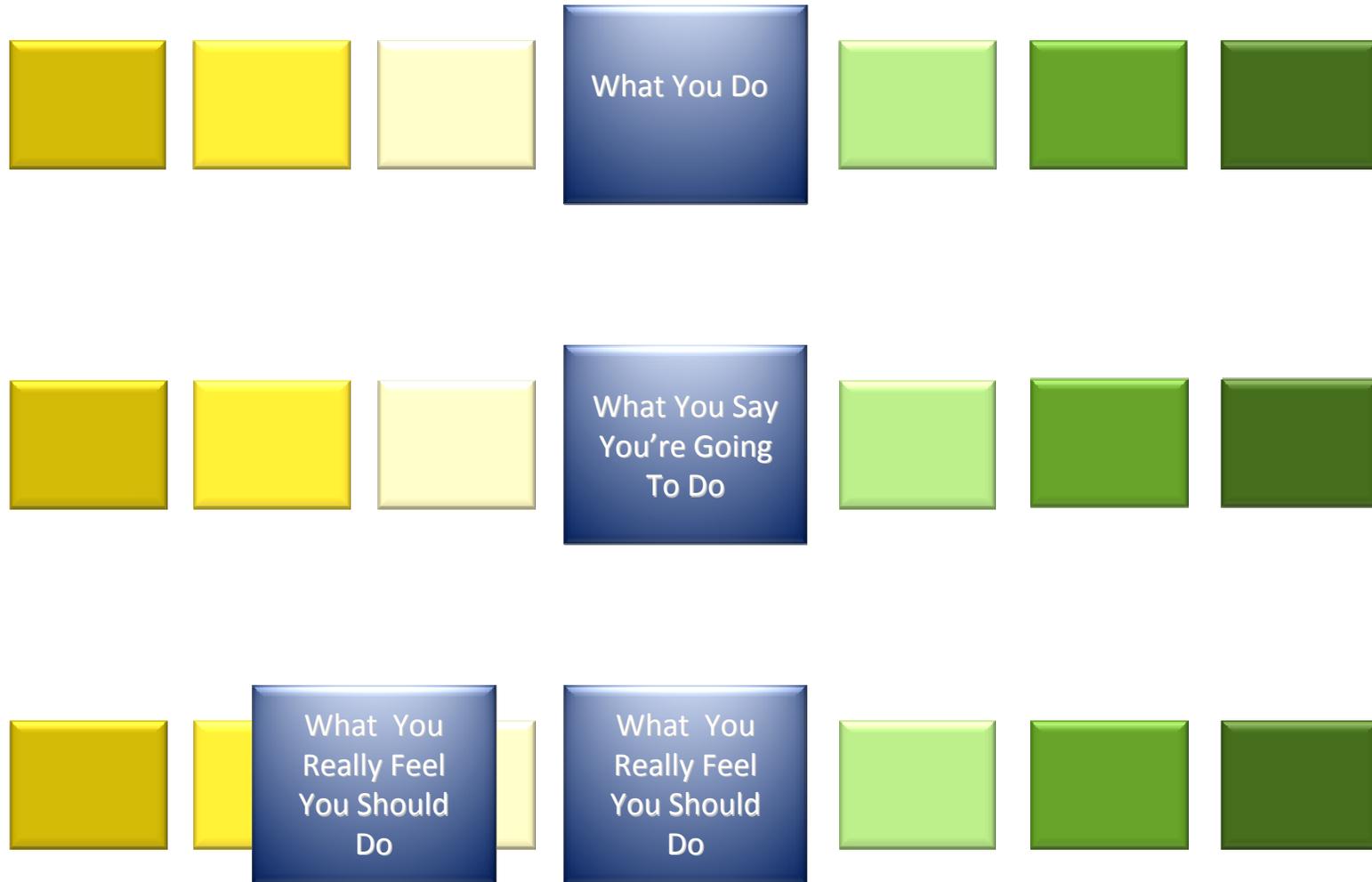
What You
Really Feel
You Should
Do

Underlying Assumptions

Weak Organizational Culture

Production

Protection

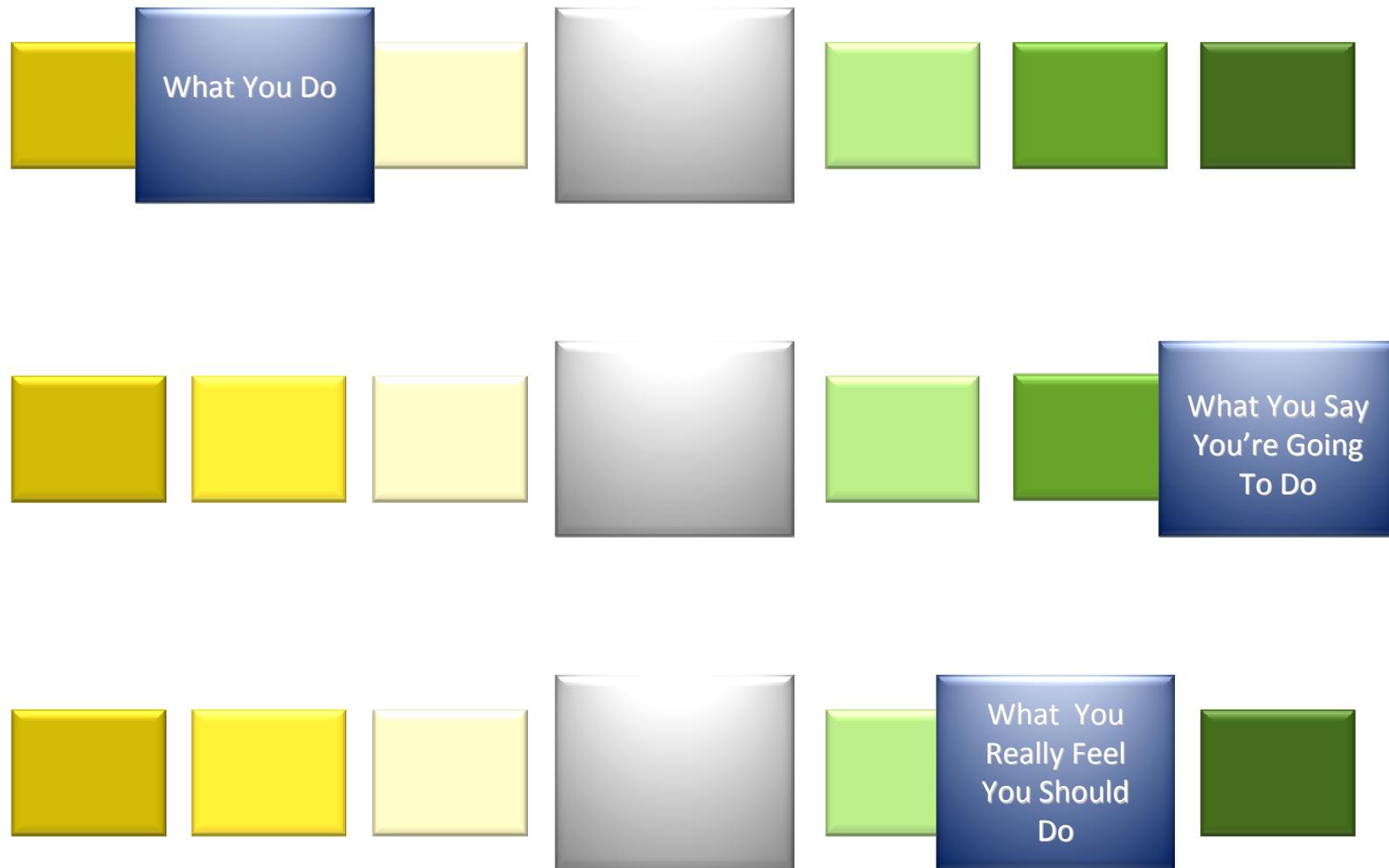


Adapted from Schein, Organizational Culture and Leadership

Strong Organizational Culture

Production

Protection



Adapted from Schein, Organizational Culture and Leadership

Strong Organizational Culture

Production



Protection

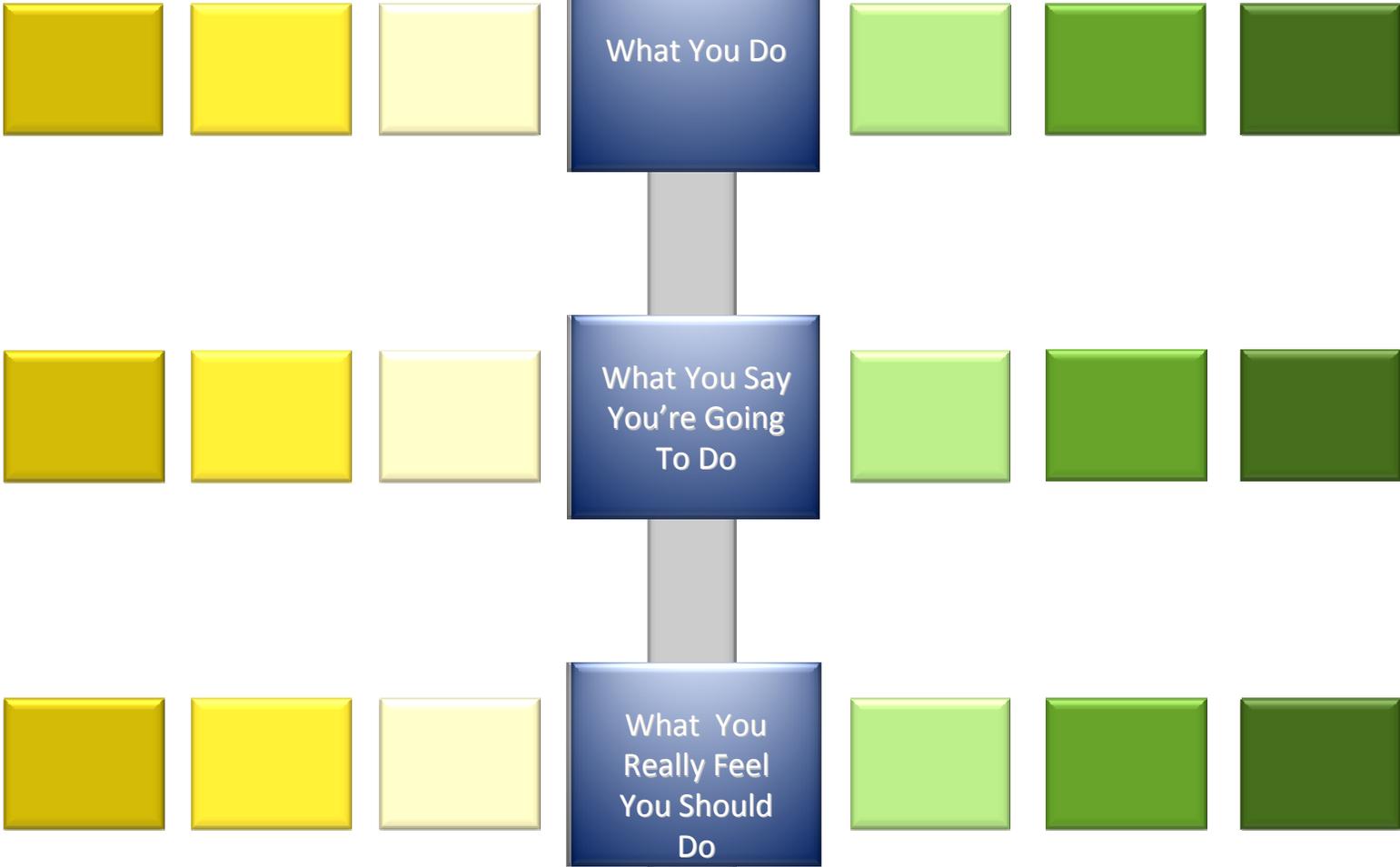


Adapted from Schein, Organizational Culture and Leadership

Healthy Organizational Culture

Production

Protection

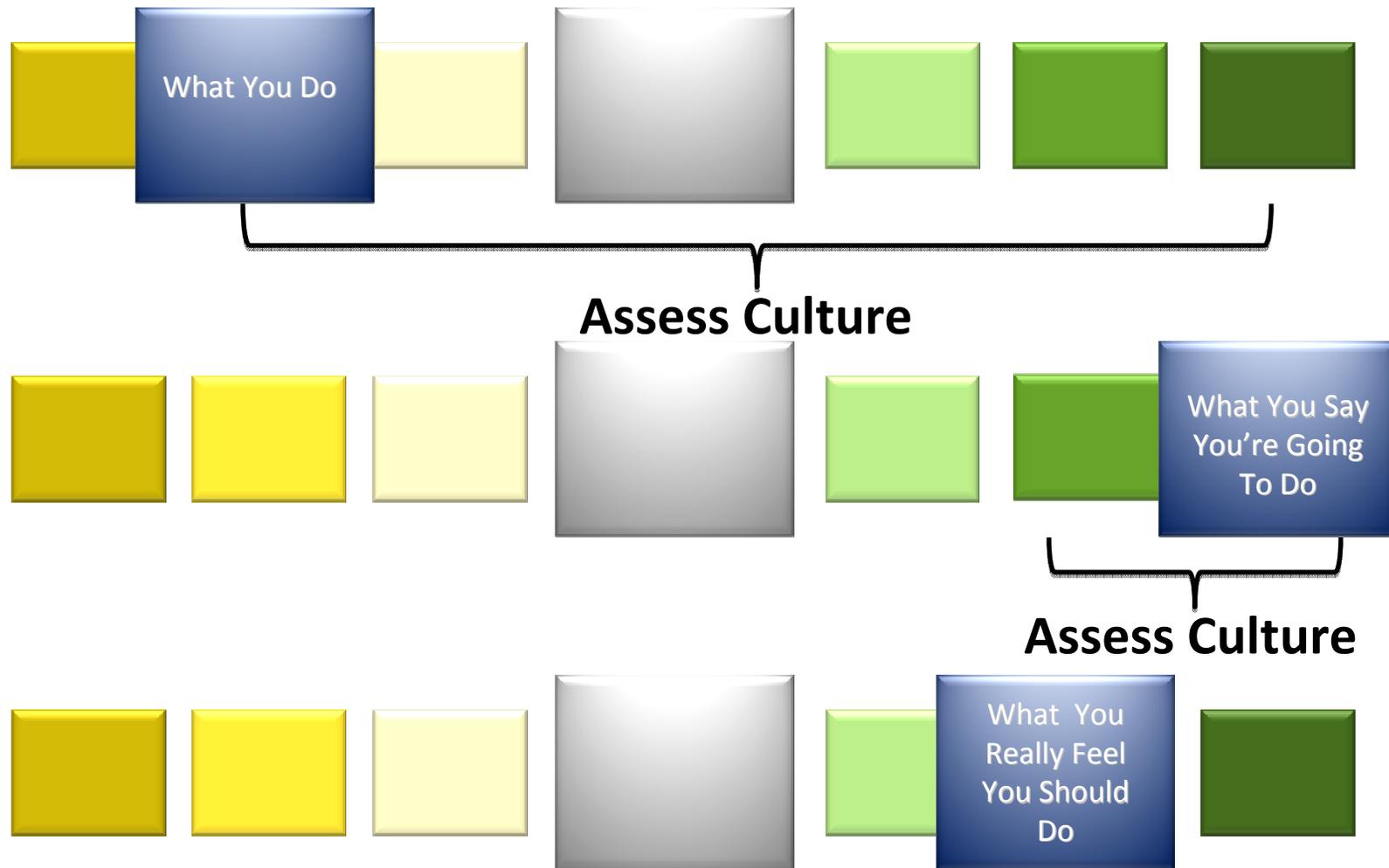


ALIGNMENT & BALANCE

Assess Organizational Culture

Production

Protection



Adapted from Schein, Organizational Culture and Leadership

Culture of Reliability – Searching for Weak Signals



Take action
BEFORE barriers
are challenged!



Safety culture ensures operations remain protected behind intact barriers -- inward focus

Safety Culture

Safety Culture

Safety Culture

Good

Culture of reliability – focused beyond safety – looking outward for weak signals

Culture of Reliability

Safety Culture

Safety Culture

Better

Take action HERE.
Before your barriers/defenses are challenged

To make sure
your High
Reliability
Operations
remain protected
behind intact
barriers

Culture of Reliability

Safety Culture

Safety Culture

Take action HERE.
Before your barriers/defenses
are challenged

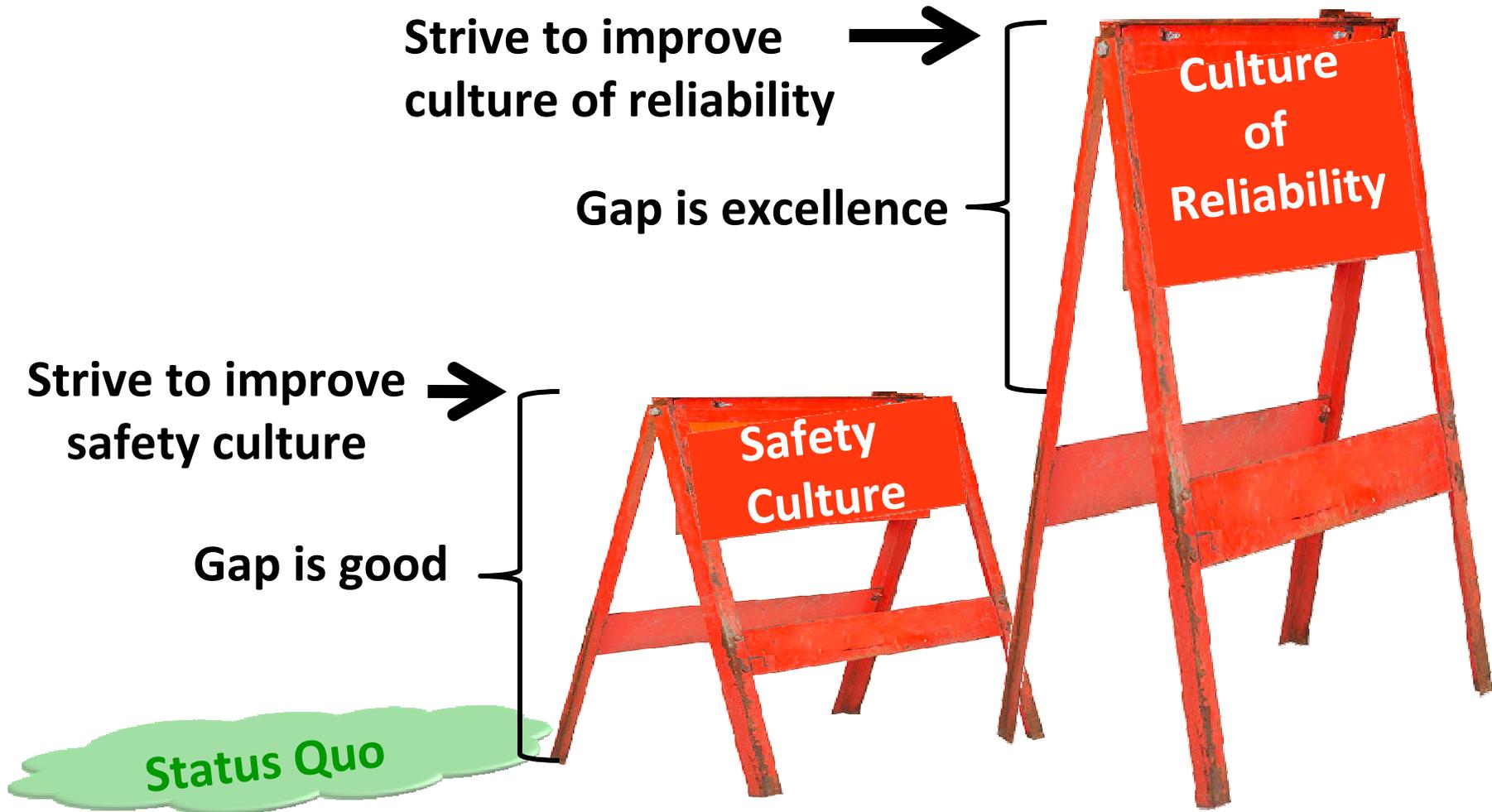
Results of a Culture of Reliability



Organization focuses beyond safety, to the practices of high reliability to produce consistent, dependable, and excellent products and services while looking for weak signals before they challenge the HRO system.

Culture of Reliability

Strive for Perfection – be Satisfied with Excellence



Chronic Unease



Dr. James Reason

“If the price of peace is eternal vigilance,
then the price of safety is chronic unease.”

James Reason



Managing the Risks of Organizational Accidents, James Reason



Conclusion on High Reliability Organizations

What Should You Take Away from this Presentation?



The Cure for Organization Blindness

"Most ailing organizations have developed a functional blindness to their own defects. They are not suffering because they cannot resolve their problems, but because they cannot see their problems."

John Gardner

Weak Signals



What Can You Expect Out of the HRO Process?

- Focus on the “Important” (or Wildly Important)
 - Helps everyone understand the importance of their role in the bigger picture
- Increased Value to Your Customers as You Strive to Become an HRO
- Increased Employee Involvement & Buy-in Investigating Low Consequence, yet Organizationally Rich Events
 - Positive Atmosphere Where Employees Less Afraid to Report Errors
- Empowerment
 - Framework to understand
 - Ability to challenge
 - Responsibility to engage



**ARE YOU ETERNALLY
VIGILANT OR ARE YOU
NORMAL?**

IT CAN HAPPEN!



Some organizations have no choice except to be a
High Reliability Organization!

**Can your
organization afford
any less?**



Take Aways on High Reliability Organizations

- Focus on What is Important, Measure What is Important
- HRO vs. NAT, its Not One or the Other
- Systems Accident, Not Individual Accident
- Systems Approach to Avoid Catastrophic Event
- Four HRO Practices to Provide Systems Approach
- Strive to become an HRO – Improve Organizational Culture



Should Your Business Be A High Reliability Organization?

- Simply put, if your organization **cannot recover** from the consequences of a systems accident in your operations, then consider learning and applying the concepts and practical application of high reliability.



Recommended Reading Material

- The Limits of Safety, Scott D. Sagan
- Normal Accidents – Living with High-Risk Technologies, Charles Perrow
- Managing the Unexpected, Karl E. Weick & Kathleen M. Sutcliffe
- Managing the Risks of Organizational Accidents, James Reason
- Organizational Culture and Leadership, 3rd ed., Edgar Schein
- Field Guide to Human Error Investigations, Sidney Dekker
- Pantex High Reliability Operations Guide
- Pantex Causal Factors Analysis Handbook





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Want to learn more?

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QUESTIONS?

