

# Human Performance Improvement



Continuous Security Improvement

# Objectives

- Recognize the role of human fallibility and organizational systems in security events and incidents
- Determine evaluation techniques to identify security-related error-likely situations before security events occur
- Identify error prevention tools to help customers address latent security weaknesses in their systems

# Objectives cont'd

- Identify how to communicate security event and incident reduction tools with “customers”
- Demonstrate appropriate CA and CAP methods and criteria to help managers work effectively with Security when events occur.

# Human Performance

***“People do not operate in a vacuum, where they can decide and act all-powerfully. To err or not to err is not a choice. Instead, people’s work is subject to and constrained by multiple factors”.***

***— Sidney Dekker***

# Definitions

- **Error**: An unintentional deviation from an expected behavior.
- **Violation**: Deliberate, intentional acts to evade a known policy or procedure requirement for personal advantage usually adopted for fun, comfort, expedience, or convenience

# Refresher: HPI Principles

- 1. People are fallible**
- 2. Error-likely situations are predictable**
- 3. Individual behaviors are influenced**
- 4. Operational upsets can be avoided**
- 5. People achieve high levels of performance based encouragement and reinforcement.**

# People Are Fallible

## HPI Principle #1:

***People are fallible and even the best make mistakes.***

# Basketball

- Count the number of passes between white-shirted players
- You **MUST** be accurate
- **PAY ATTENTION!**

# Limitations of Human Nature

***Mistakes arise directly from the way the mind handles information, not through stupidity or carelessness.***

***— Dr. Edward de Bono***

# Limitations of Human Nature

See page 4 in your Concepts Guide

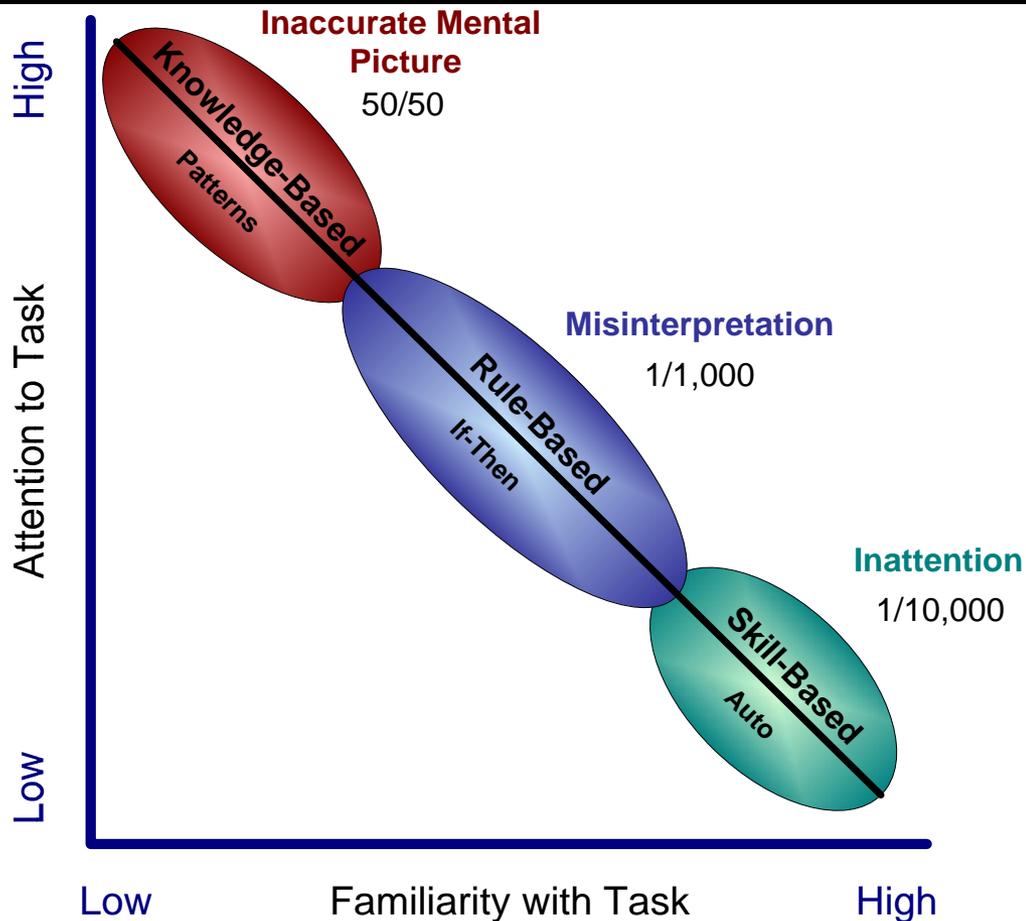
- **Stress**
- Avoidance of **mental strain**
- Inaccurate **mental models**
- Limited working **memory**
- Limited **attention** resources
- **Mind set**
- Difficulty **seeing** own errors
- Limited **perspective**
- Susceptible to **emotion**
- Focus on the **goal**
- **Fatigue**

# Error Prevention Tools

- Self-checking
- Peer-checking
- Concurrent verification
- Independent verification
- Questioning attitude
- Conservative decision making
- Stop When Unsure

# Performance Modes

See page 7 in your Concepts Guide



When switching from one performance mode to another a worker is presented with a new situation but has only old information on which to base decisions.

# Error Traps

## HPI Principle #2:

***Error-likely situations are predictable, manageable, and preventable.***

# Saw Stop™



# Identification of Critical Tasks

- If you try to fix everything, you will go broke and crazy.
- You must pinpoint the critical areas of your processes and duties to identify places which have the greatest security risk and greatest value to the stability and reliability of your work.

# Error Precursors –USE JLs

See page 18 in your Concepts Guide

<b>Task Demands</b>	<b>Individual Capabilities</b>
• Time pressure (in a hurry)	• Unfamiliarity w/ task / First time
• High Workload (memory requirements)	• Lack of knowledge (mental model)
• Simultaneous, multiple tasks	• New technique not used before
• Repetitive actions, monotonous	• Imprecise communication habits
• Irrecoverable acts	• Lack of proficiency / Inexperience
• Interpretation requirements	• Indistinct problem-solving skills
• Unclear goals, roles, & responsibilities	• “Hazardous” attitude for critical task
• Lack of or unclear standards	• Illness / Fatigue
<b>Work Environment</b>	<b>Human Nature</b>
• Distractions / Interruptions	• Stress (limits attention)
• Changes / Departures from routine	• Habit patterns
• Confusing displays or controls	• Assumptions (inaccurate mental picture)
• Workarounds / OOS instruments	• Complacency / Overconfidence
• Hidden system response	• Mindset (“tuned” to see)
• Unexpected equipment conditions	• Inaccurate risk perception (Pollyanna)
• Lack of alternative indication	• Mental shortcuts (biases)
• Personality conflicts	• Limited short-term memory

# The Organization

## HPI Principle #3:

***Individual behavior is influenced by organizational processes and values.***

# New vs. Old View of Human Error

- Human error is a cause of security events and incidents accidents
  - To explain failure, investigations must seek failure
  - They must find people's inaccurate assessments, wrong decisions and bad judgments
- Security events and incidents can be symptoms of trouble deeper inside a system...
  - To explain failure, do not try to find where people went wrong.
  - Instead, find how people's assessments and actions made sense at the time, given the circumstances that surrounded them.

# Types of Error

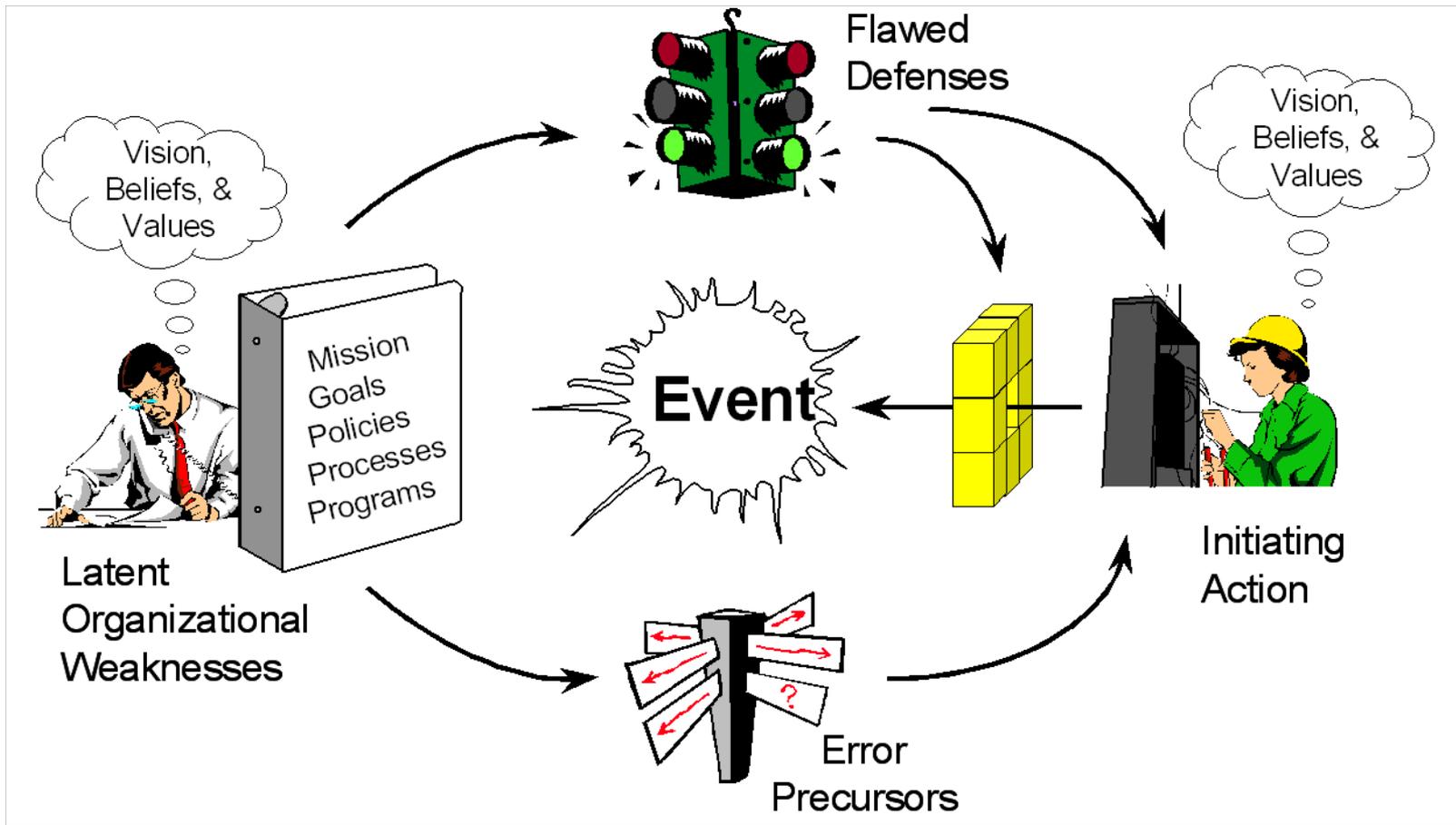
See page 12 in your Concepts Guide

- **Active Errors** change equipment, system or processes that trigger immediate undesired consequences.
- **Latent Errors** result in undetected organization-related weaknesses or equipment flaws that lie dormant.

# Understanding Events

- Incentives are the cornerstone of human behavior
- Dramatic events often have distant even subtle causes
- Conventional wisdom is often wrong
- Knowing what to measure and how to measure it makes a complex world much less complicated

# Anatomy of an Event



# Organizational Processes

***Workplaces and organizations are easier to manage than the minds of individual workers. You cannot change the human condition, but you can change the conditions under which people work.***

***— Dr. James Reason***

# Organizational Values

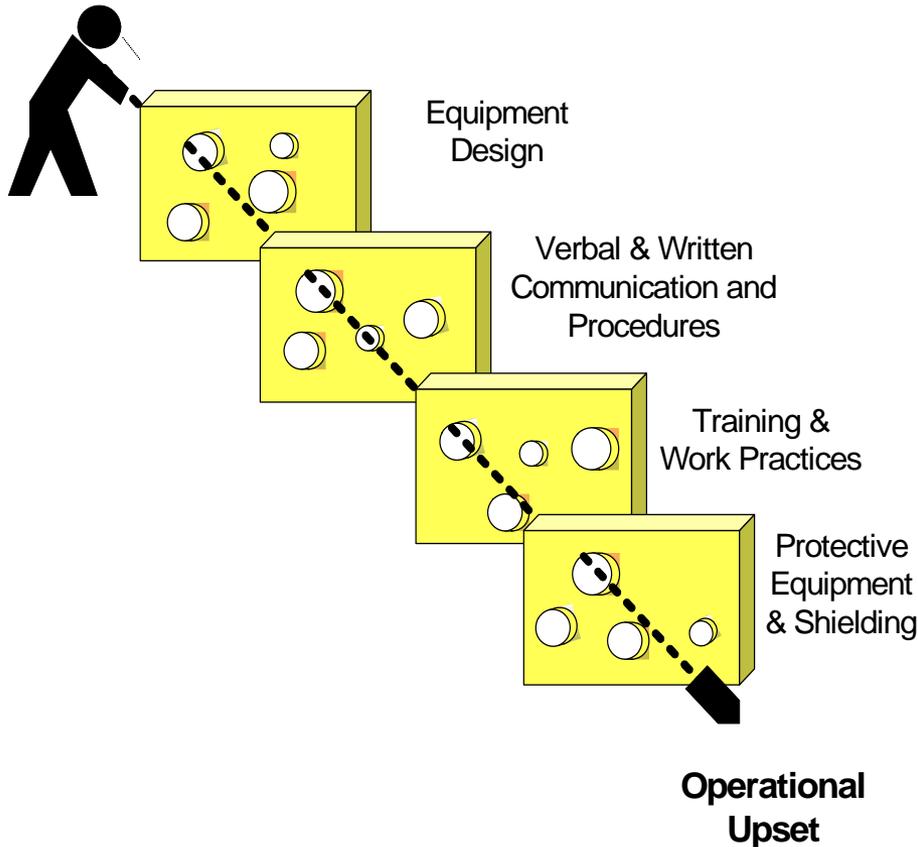
## HPI Principle #4:

***Operational upsets can be avoided by understanding the reasons mistakes occur and applying the lessons learned from past events.***

# Defenses in Depth

See page 14 in your Concepts Guide

Active Error



- Redundancy: many layers of protection.
- Diversity: many different varieties of protection.
- Independence: separate/autonomous layers of protection.

# Performance Culture

See page 28 in your Concepts Guide

- **Encourage Reporting:** Value errors as leading safety data
- **Create a Just Work Environment:** Don't try and punish errors out of the system
- **Flexibility:** Prepare workers to adapt effectively to changing demands
- **Learning:** Create opportunities for observation, reflection and feedback

# Impediments to Reporting

- Fear of reprisal
- Systems that are difficult to use
- Data goes into black hole (no feedback and/or no action to solve problem)
- Assumed lack of resources or will on the part of management

# Latent Organizational Weakness (LOW)

## **Defined:**

Undetected deficiencies in processes or values that create work-place conditions that either provoke error or degrade the integrity of defenses

# Eliminating LOW

- Solicit and act on feedback from workers
  - Use inconsequential errors as leading data of LOW
- Monitor trends in facility and behavior
  - Observation
- Do Self-assessment
- Benchmark
- Conduct process mapping & task analysis
- Determine fundamental causes through causal analysis

# Causal Analysis

A worker makes an error, information is collected, a reason for the problem is formulated, and we address the worker's error.  
**We're done, right?**

**WRONG**-the initiating error is just the beginning.

- Look deeper.
- What caused the worker to err?
- Usually more than meets the eye.

# Cause is Something We Construct

- Causal factors can be complex and interconnected-the active error is often not obvious.
- Cause is partially formulated based on the investigators' training and perspective.
- Cause is also dependent on how the investigator defines the scope of the issue.
- Humans are one part of an organizational system
- Think in terms of “multiple causes,” not one root cause.

# Pull the Thread

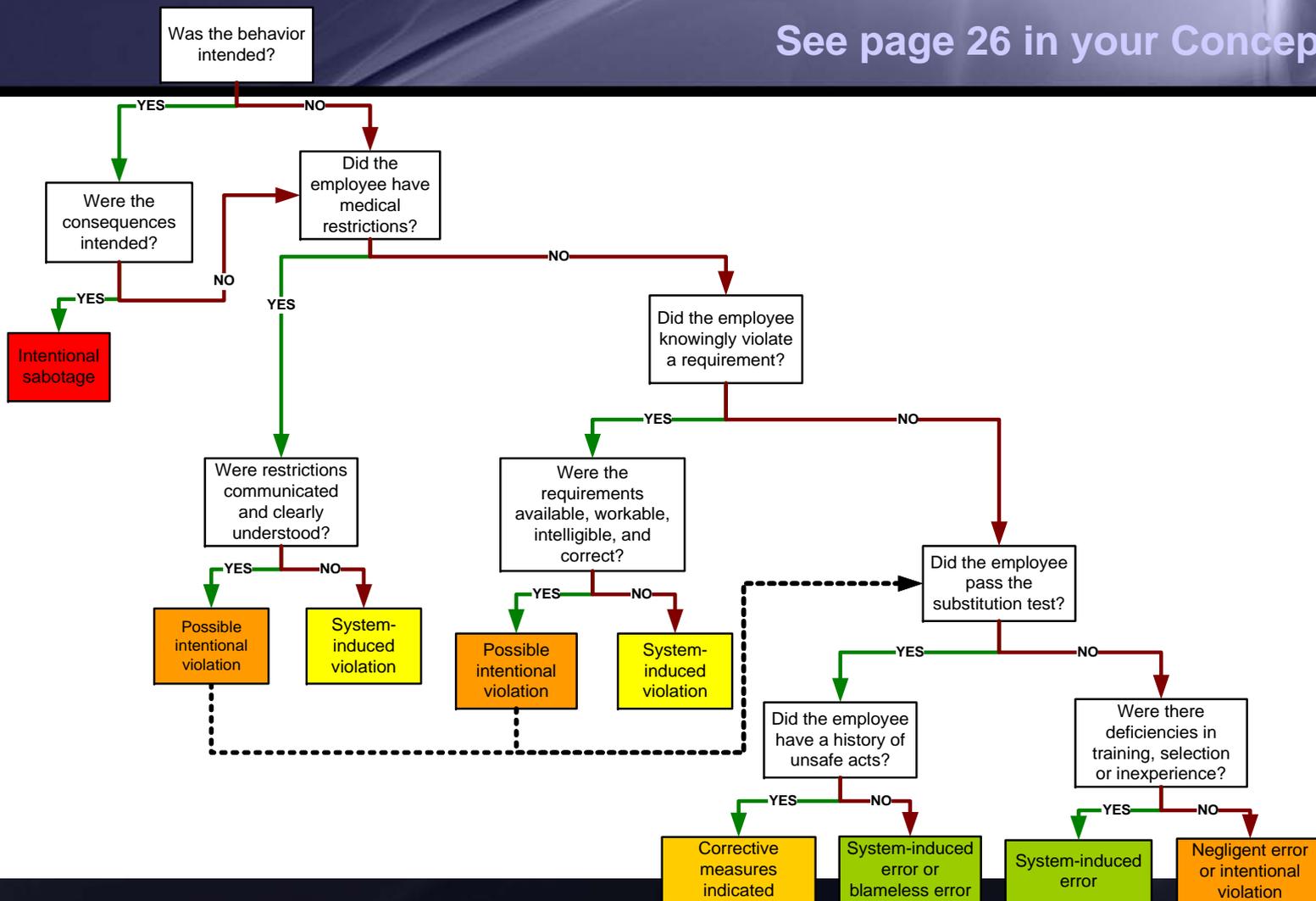
- Don't stop at the active error
- Difficult to see all the latent errors (flawed barriers, controls) involved
- Look at how the systems drove behavior
- Examine how organization allowed or encouraged the error
- What made the decision seem appropriate at the time?

# Addressing Issues

- Look at system-wide factors to create long-term improvement
- Get help from the SMEs (often the workers!)
- Abandon the “fallacy of the quick fix”

# Culpability Decision Tree

See page 26 in your Concepts Guide

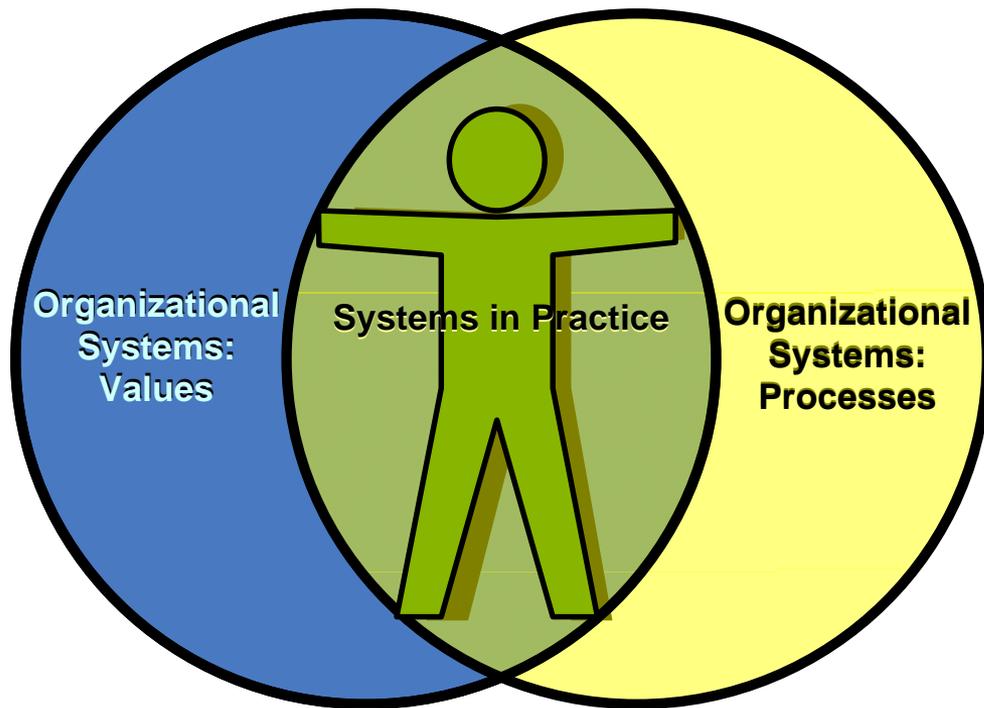


# The Leader

## HPI Principle #5:

***People achieve high levels of performance based largely on the encouragement and reinforcement received from peers, leaders, and subordinates.***

# Human to Systems Interface



- People will never perform better than what the organization will allow
- If a system relies on people doing the right thing every time, it will fail
- No working system remains in stasis

# Reality Check

- **Security values** express how you desire security to be in your organization.
- **Security systems** are real defenses and actionable programs that provide measurable security data sets.