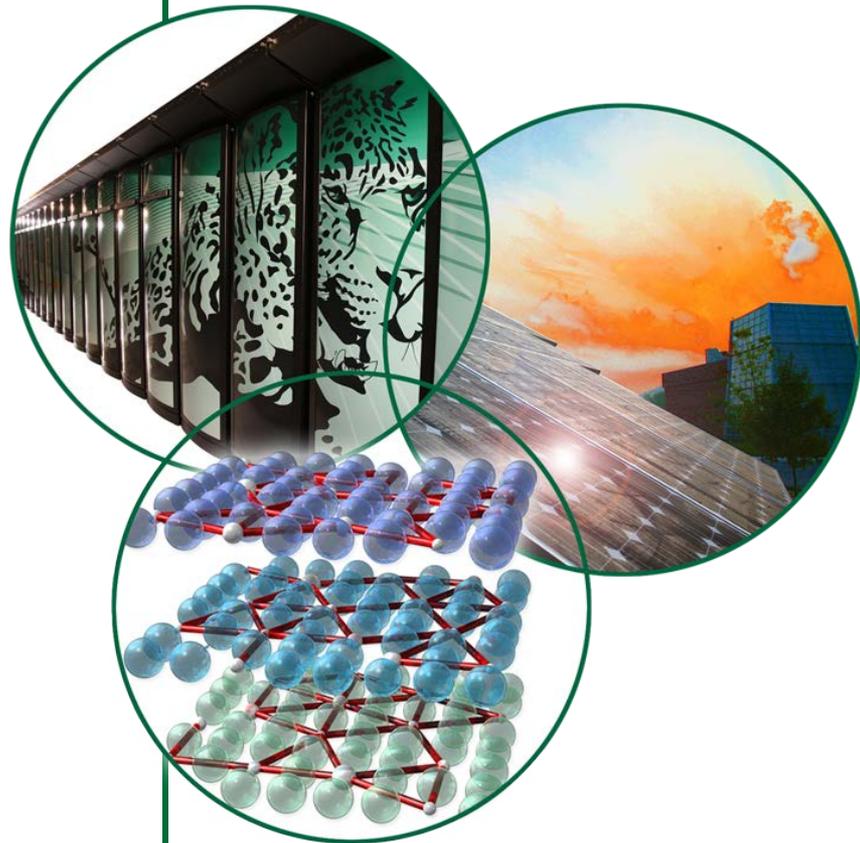


2009 AMWTP HPI Summit

# Human Performance Culpability Evaluations

Using an integrated decision tree, with working definitions and instructional guidance, for conducting evaluations of culpability in workplace incidents.

Andy Hobbs  
UT-Battelle  
Office of Integrated Performance  
November 18, 2009



# Overview

- **First, we will:**
  - Discuss the need for just culture and a tool that reinforces it
  - Establish definitions of key terms
  - Examine the relationships between key terms
  - Review research of various versions of the Culpability Decision Tree
- **Next, we will:**
  - Outline key elements of various versions
  - Review the Integrated Culpability Decision Tree
  - Review the guidelines and instructions for using the tree
- **Lastly, we will**
  - Use case studies to practice using the integrated tree

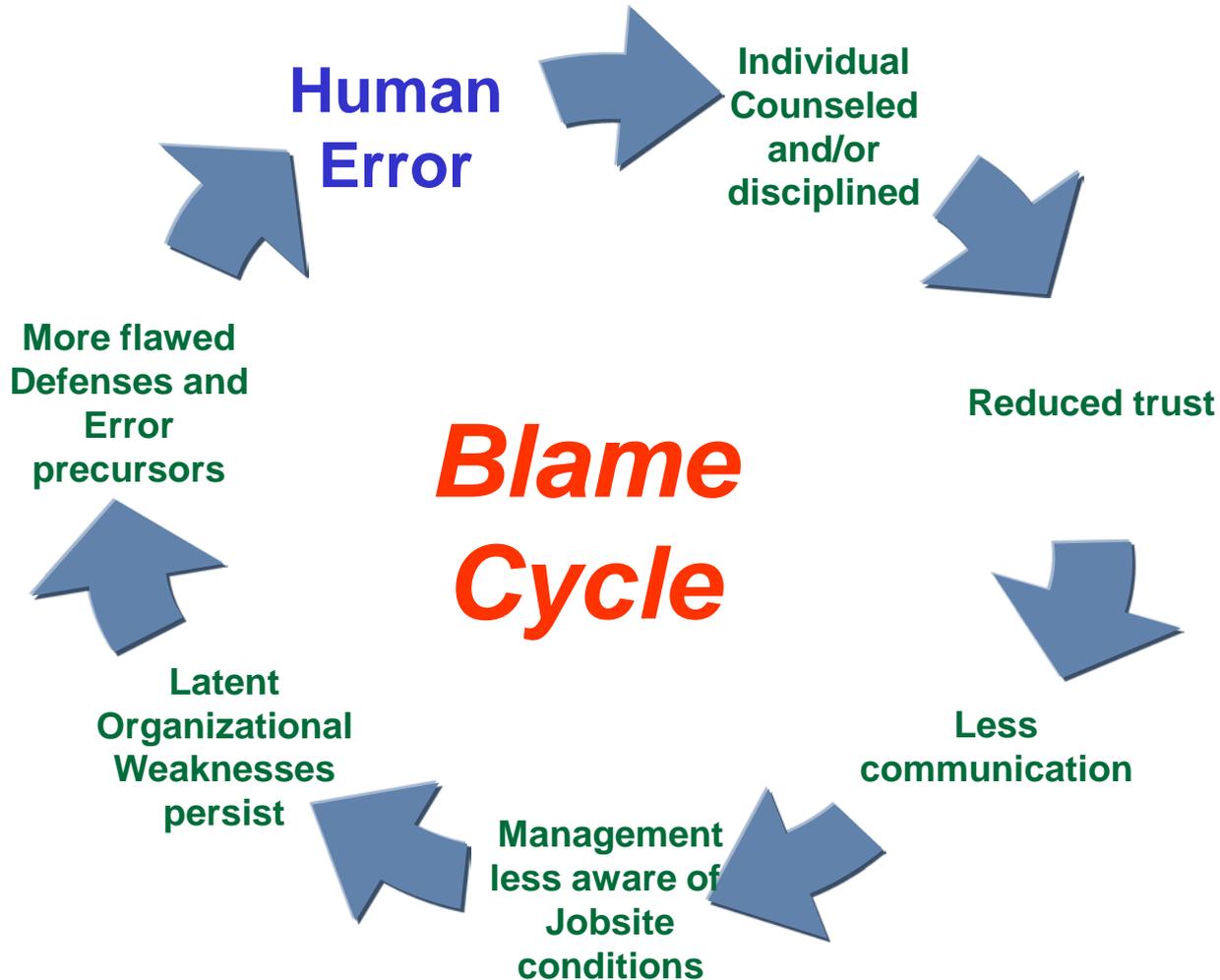
# The Need for a Just Work Culture

- If a work culture does not tolerate error, people will be unlikely to reveal errors and mistakes.
- If investigations are a search for someone to blame, people will do what they can to avoid being blamed.
- A focus on what was violated will usually miss key information of why people did what they did and why it made sense to them at the time.

“The factors that influence decisions must be considered, of which, from a safety perspective, the primary influence is risk perception. In a safety context, risk is a certain level of danger to people, environment or even assets. In the performance of work, when a person assesses risk and makes a decision, they are basically asking themselves ‘What can go wrong?’, ‘What is the likelihood of occurrence?’, and ‘What are the consequences?’”

Korvers & Sonnemans (2007)

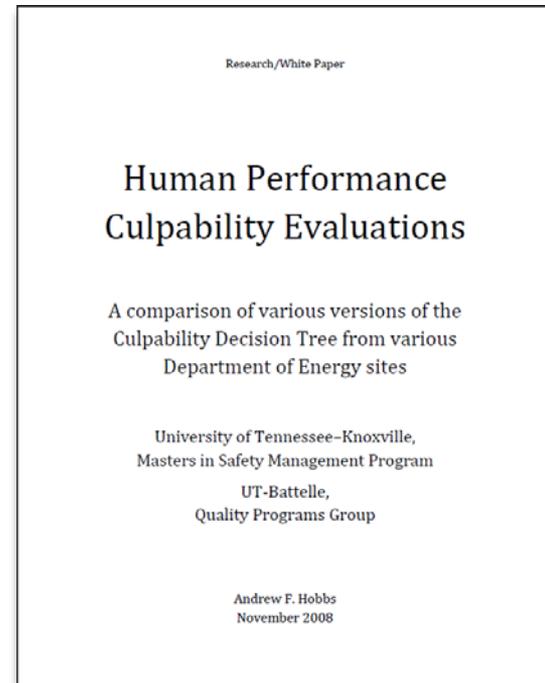
# INPO's Blame Cycle





# Objectives of Research Project

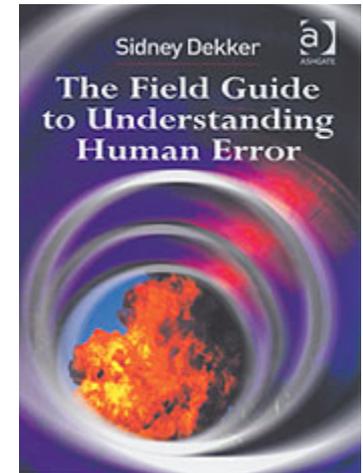
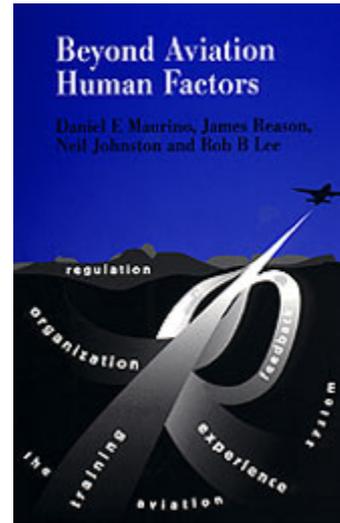
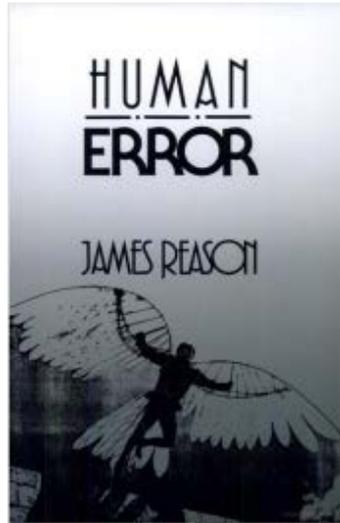
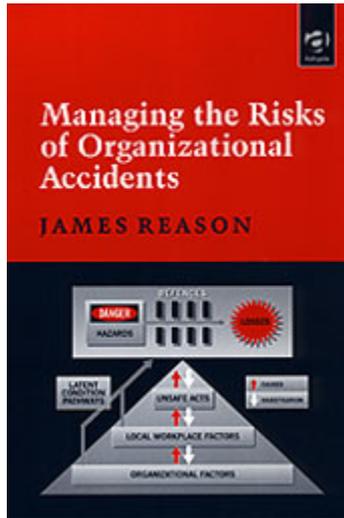
- Personal research project started in March 2008, completed in October 2008. Paper published in November 2008.
- Two main objectives:
  - Document the findings of the review of culpability decision trees and associated procedures or guidelines used at various DOE sites or DOE-related companies.
  - Develop a version of the tree that integrates the “best” of the various versions, as well as detailed guidance for its application and use.



# Limitations of Study

- **Included only 9 alternate versions; all versions in use in DOE not included.**
- **Limited availability of pertinent and related technical references.**
- **No interaction with developers of other versions to determine bases for modifications to Reason's original design.**

# Some References





**Human Performance Fundamentals Course Reference**



December 2002  
Revision 6

PERFORMANCE REFERENCE MANUAL

FOR NUCLEAR POWER OPERATIONS

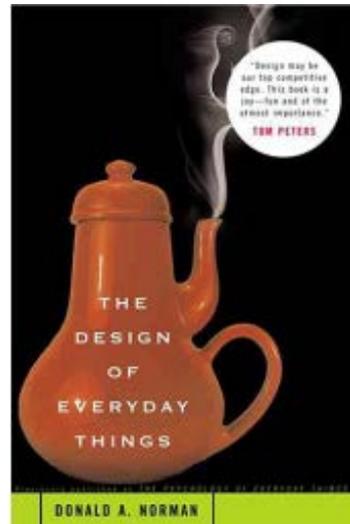
October 2006

INPO 06-003

Plant Area:  
Human Performance

Key Words:  
Performance, Human Factor, Personnel Error

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Presentation\_name



Man-made disasters: why organizations fail

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Safety Science 42 (2004) 217–270

**Abstract**

The paper presents a systems view of the origins of accidents and disasters, and in particular the role of human error. It highlights the fact that in seeking the cause of an accident, one must consider the interaction between the human and the system. Such accidents, so-called 'organizational accidents', stem from which are at odds with the culturally taken for granted assumptions of accident causation. Theoretical models for the development of accidents and their causes, in the context of 'organizational' accidents, are discussed. Recent research, however, about hazards is a common assumption of such a model. The fall lessons from past incidents arising from disasters are: (1) information deficiencies; (2) ways of addressing these hazards are discussed, as an illustration of institutional self-design, is a key to safety.

**Keywords:** Man-made disasters; theory; Safety culture; Disasters

**1. Failures in complex systems: man-made disasters**

The first contemporary theoretical account of disasters was Barry Turner's path-breaking '1976' Turner and Pidgeon, 1997). This monograph, however, is a contemporary reference for disaster and safety.

\* Corresponding author.  
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A new accident model for engineering safety systems

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Safety Science 42 (2004) 217–270

**Abstract**

New technology is making fundamental changes in the etiology of accidents and is creating a need for changes in the explanatory mechanisms used. We need better and less subjective understanding of why accidents occur and how to prevent future ones. The most effective models will go beyond assigning blame and instead help engineers to learn as much as possible about all the factors involved, including those related to social and organizational structures. This paper presents a new accident model founded on basic systems theory concepts. The use of such a model provides a theoretical foundation for the introduction of unique new types of accident analysis, hazard analysis, accident prevention strategies including new approaches to designing for safety, risk assessment techniques, and approaches to designing performance monitoring and safety metrics.

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**1. Introduction**

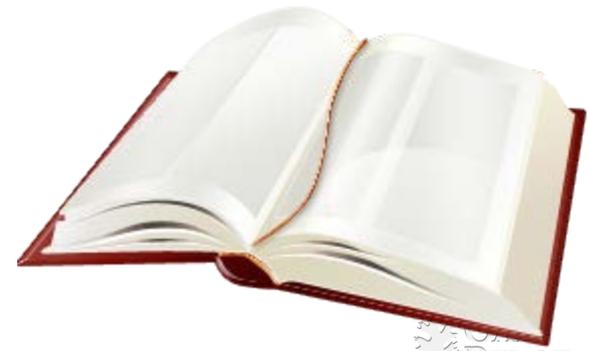
Accident models form the basis for investigating and analyzing accidents, preventing future ones, and determining whether systems are suitable for use (risk assessment). In accident investigation they impose patterns on the accident and influence both the data collected and the factors identified as causative. They also underlie all hazard analysis and risk assessment techniques. Because they influence the factors considered in any of these activities, they may either act as a filter and bias toward considering only certain events and conditions or they may expand activities by forcing consideration of factors that are often omitted.

Most accident models view accidents as resulting from a chain or sequence of events. Such models work well for losses caused by failures of physical components

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doi:10.1016/j.ssci.2004.06.004-X

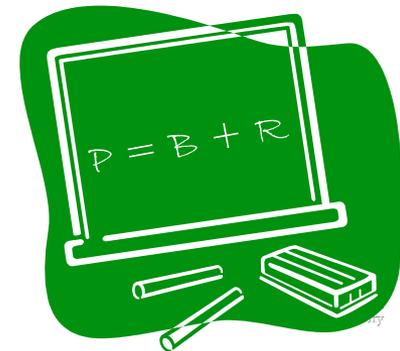
# Key Terms to Define & Understand

- Performance, Behavior, Results
- Error
- Performance Mode
- Consequences
- Violation
- Sabotage
- Accountability
- Culpability



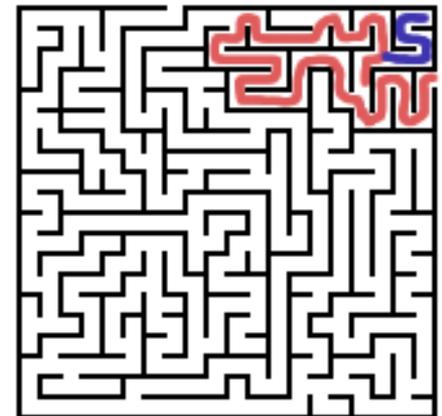
# Performance, Behavior & Results

- *Performance* – the *behavior* of an individual or group of individuals plus the *results* of that behavior, considered as a whole;  $P = B + R$
- *Behavior* – a human act or sequence of human actions; consists of:
  - a plan or intention (a goal plus the means to achieve it),
  - a sequence of actions initiated by the plan, and
  - the extent of success in achieving the goal as each action is performed.
- *Results* – the final outcomes of *behavior* strictly in terms of success or failure in achieving the intended goal, irrespective of the correctness or accuracy of risk perception on the part of the individual(s) involved.



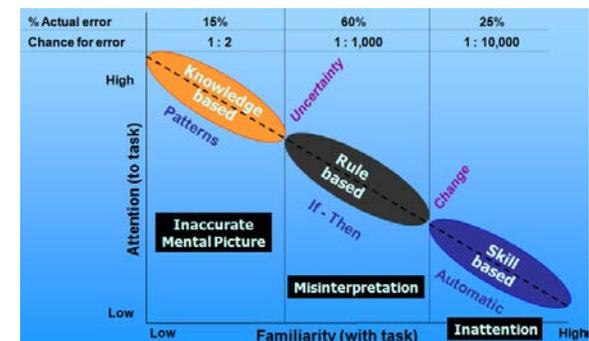
# Errors and Performance Modes

- *Error* – an unintentional deviation from expected behavior.
- *Performance Mode* – the manner in which a person acts in terms of information processing when executing a task or activity. The three performance modes are:
  - skill-based
  - rule-based
  - knowledge-based



# “Error Modes”

- Modes of performance can be referred to in terms of errors committed, i.e.
  - ❑ *Skill-based Error* – an error associated with highly-practiced actions in a familiar situation.
    - Plan was adequate, actions did not go as planned
  - ❑ *Rule-based Error* – an error associated with behavior based on selection of stored rules derived from one’s recognition of the situation.
    - Actions conformed to plan, plan was inadequate due to misinterpretation
  - ❑ *Knowledge-based Error* – an error associated with behavior in response to a totally unfamiliar situation (no skill, rule or pattern recognizable to the individual).
    - Actions conformed to plan, plan was inadequate due to inaccurate mental picture



# Results vs. Consequences

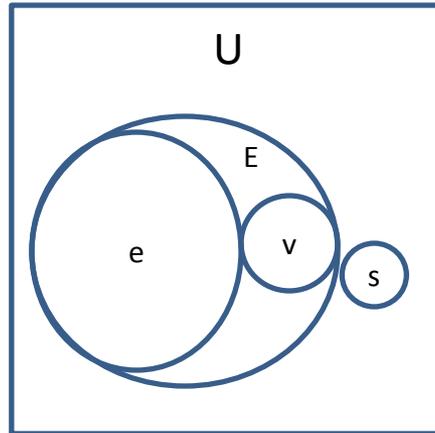
- In terms of achieving the goal, *results* was restricted to those outcomes that immediately follow the action.
- *Consequences* are the final, overall effect(s) or outcome(s) of an individual's behavior with respect to the situation or environment in which the behavior occurred.
- Distinction necessary to understand what was planned and intended vs. all outcomes (actual and potential) viewed retrospectively.



# Violation vs. Sabotage

- Remember that *error* refers to an unintentional deviation from expected behavior (including unwritten/verbal direction, norms, cultural influences, etc.).

U = human behavior  
E = human error  
e = errors (unintentional)  
v = violations (intentional)  
s = sabotage



- Violation refers to the intentional deviation from expected behavior as specified in operational procedures, rules, or standards, but in which the consequences were not intended.
- Sabotage* – behavior in which both the act and the damaging outcome were intentional.



# Accountability vs. Culpability

- *Accountability* is often confused with *enforcement*.
- *Accountability* refers to the work culture and the degree to which an employee will or is willing to account for his/her actions, the results of those actions, and his/her understanding of his/her responsibilities.
- *(Individual) Culpability* – the amount of blameworthiness that an individual's behavior merits based on:
  - the nature of the deviation from expected behavior,
  - the outcomes of the deviation, and
  - the responsibility and authority of that individual,in the context of the situation in which the behavior occurred.



# The Investigator's Dilemma

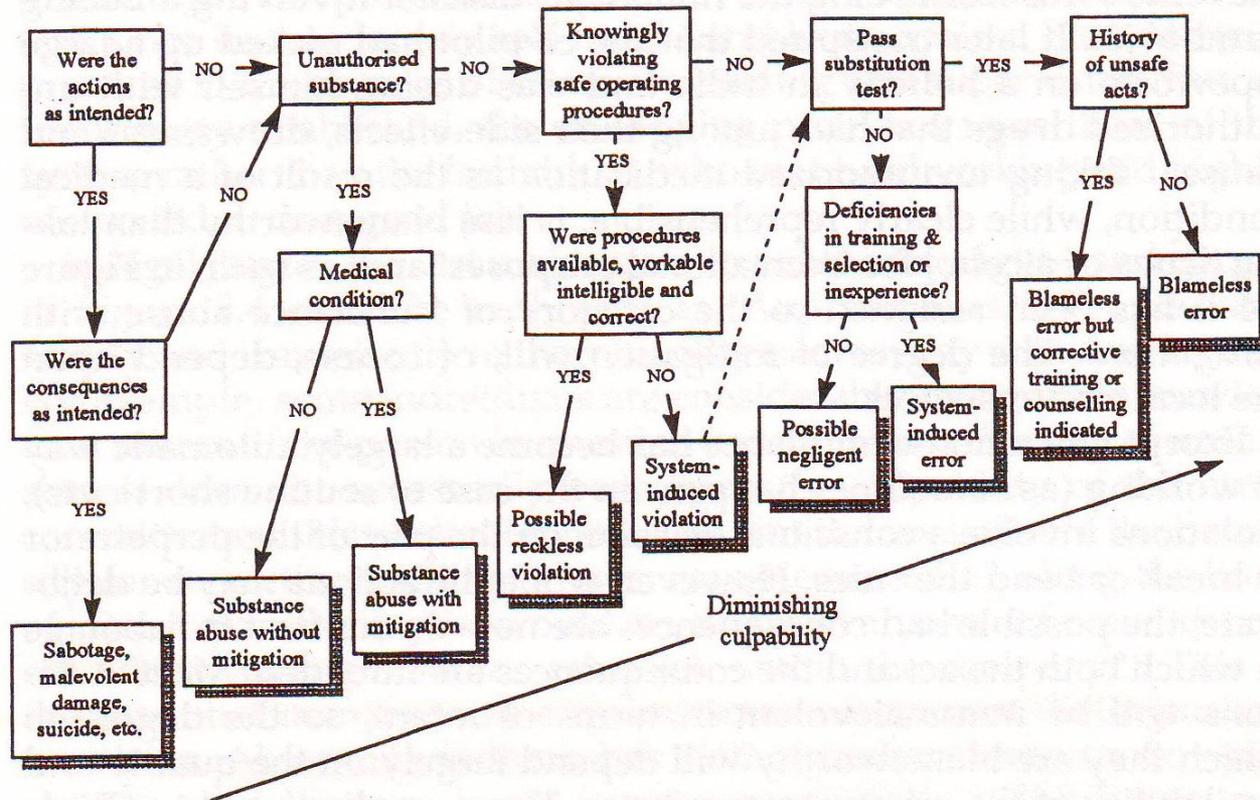
“On the one hand we must recognize the importance of individual accountability, while on the other we must recognize that front-line personnel do not act in a manner which is independent of company working custom and practice—or ‘organizational sub-culture.’” The objective ... is to determine “the role played by organizational working ‘realities.’”

Maurino , Reason, Johnston, Lee (1995)

- **What we need is a way to fairly and consistently evaluate the culpability of individuals involved in workplace incidents.**

# James Reason's Start

- In his 1997 book *Managing the Risks of Organizational Accidents*, Reason “sketch[ed] out the bare essentials of a decision tree for discriminating the culpability of an unsafe act.”



# Reason's Intent

- As to its intended application Reason states the following assumption:

“It is assumed that the actions under scrutiny have contributed either to an accident or to a serious incident in which a bad outcome was only just averted. In an organizational accident, there are likely to be a number of different unsafe acts, and the decision tree is intended to be applied separately to each of them... [The number of] individuals whose unsafe acts are justly considered culpable [will be a] small proportion.”

- No “step-by-step” instructions given.
- Many terms not clearly defined.
- Tree presented in context of discussion of just culture, and wider context of entire book.

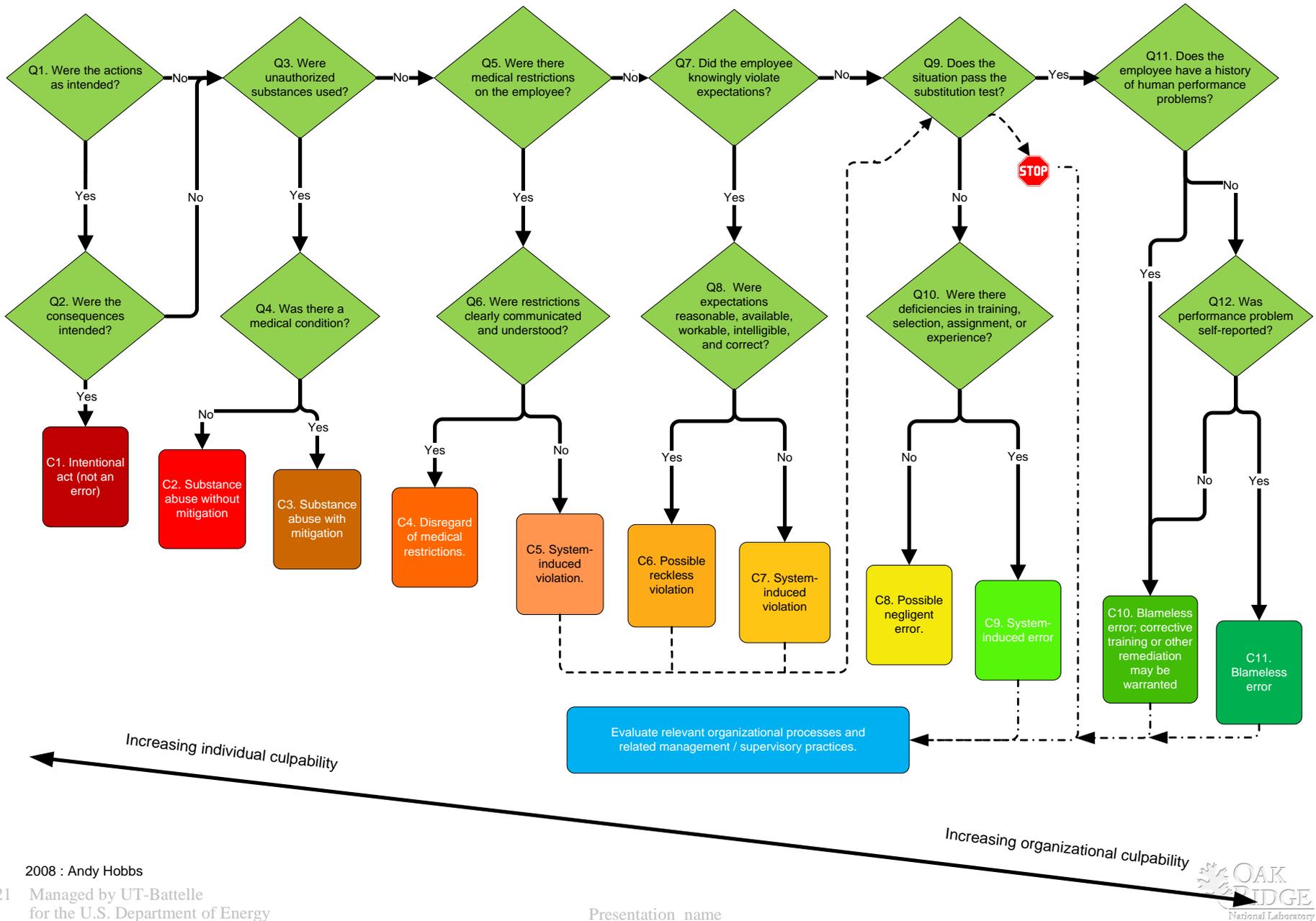
# Versions and Variations

- Study found 9 other versions of the culpability decision tree that differed from Reason's original tree, some slightly, some greatly.
- Versions limited to those found in documents obtained from various DOE sites or DOE-related companies.
- Did a methodical analysis of the differences to determine variations that improved or clarified Reason's original tree.
- Limitations of study:
  - ❖ Included only alternate versions found; all versions in use in DOE not included.
  - ❖ Limited availability of pertinent and related technical references.
  - ❖ No interaction with developers of other versions to determine bases for modifications to Reason's original design.

# Integrated Culpability Decision Tree

- Developed an integrated version of the tree that includes all branches from the various versions.
- Clearly indicated flow from branch to branch, including conditionals.
- Adapted best coloring and shapes.
- Included underlying figure to reinforce level of culpability (individual vs. system/org.).
- Included follow-up block directing further evaluation of related processes and practices.

# Culpability Decision Tree



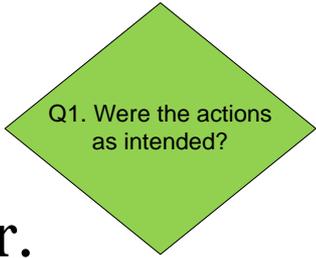
# Other Aspects of Integrated Tree Tool

- Used same methodical approach to develop labeling and numbering of blocks and guideline for use of tree.
- Distinguished *Questions* from *Conclusions*.
- Developed step-by-step instructions for traversing the tree, including explanations and guidance for:
  - the intent of the question
  - relationships to and distinctions from previous questions
  - what is needed to answer the question
  - the implications of a given answer or conclusion
- Clarified use of “substitution test.”

# Evaluating Culpability

- Use the integrated decision tree to evaluate human performance in cases where individual culpability for certain behavior is not clear.
- Facts and first-hand information must **first** be obtained from the individual or individuals involved (by means of interviews, fact-finding, etc.) before doing the evaluation.
- Tool may be used in the investigation and analysis of an event that involved behavior that deviated from that which was expected.
- This tool can be used to understand the mindset of the personnel involved, the context of the situation, and the systemic and organizational influences that may have affected their decisions and resultant behavior.

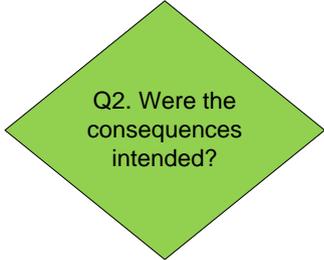
# Q1. Were the actions as intended?



Q1. Were the actions as intended?

- Question is only concerned about a specific behavior. Must know:
  - the actions being evaluated
  - the goal and how those actions related to the goal
  - the degree of success the individual had in executing the actions he/she planned to execute
- **No** – the behavior is almost certainly an error (possibly skill-based), since what he/she did is not what he/she intended to do. Continue to the next branch of the tree.
- **Yes** – you need to more completely describe the behavior and what the outcomes of that behavior were. Proceed to Q2.

## Q2. Were the consequences intended?



Q2. Were the consequences intended?

- Follows a “Yes” to Q1.
- Need to know:
  - the planned actions intended to achieve the goal
  - how successful the actions were in achieving the goal
  - the expected outcomes
  - the actual outcomes (i.e. results)
  - the other outcomes that occurred, and if they were considered/conceived of by the individual
- **No** – the error was most likely a mistake or (possibly) a violation. This case is likely to be a rule- or knowledge-based error. Continue to the next branch of the tree.
- **Yes** – go to conclusion C1.

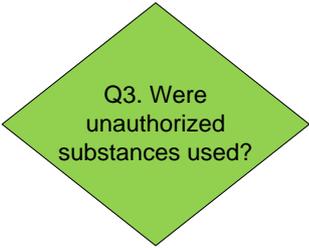
# C1. Intentional Act

C1. Intentional  
act (not an  
error)

- The first two questions relate to intention. A ‘Yes’ to both questions tells us that the actions and consequences were as intended, which means that it was not an error nor a violation.
- *C1. Intentional act (not an error)* – this was not an error; the behavior is possibly sabotage, malevolent damage, willful violation, etc.
- Leave it to others to evaluate the individual’s behavior from this point. As far as the system is concerned, the behavior was outside of systemic influences, and the individual is fully culpable for his/her actions.



# Q3. Were unauthorized substances used?



- The purpose of this question is to establish whether or not the individual was under the influence of alcohol or drugs known to impair performance at the time the actions were committed.
- Question basically looks at one potential, non-system influence on individual behavior.
- An “authorized substance” could influence behavior, but any actual influence on behavior should be considered as part of the authorization process.
- But taking an unauthorized substance does not automatically mean substance abuse. Hence Q4.
- **No** – continue to the next branch of the tree.
- **Yes** – proceed to Q4.



# Q4. Was there a medical condition?

Q4. Was there a medical condition?

- Follows a “Yes” to Q3.
- Objective is to determine if there was an actual medical condition that precipitated the individual using/taking the substance.
- In this branch, the use of the influencing substance was not authorized (outside the “system”). Next branch of tree will consider “authorized” substance use.
- The presence or absence of an actual medical condition will determine the level of individual culpability.
- So, if the answer to Q3 was “Yes” there are only two possible conclusions, which flow from the answer to Q4.



# Conclusions C2 & C3

- If **No** to Q4 (there was **not** a medical condition) → C2.  
*Substance abuse without mitigation* – company procedures for dealing with instances of substance abuse should be initiated.
- If **Yes** to Q4 (there **was** a medical condition) → C3.  
*Substance abuse with mitigation* – company procedures for providing mitigation when dealing with instances of substance abuse should be initiated.

C2. Substance abuse without mitigation

C3. Substance abuse with mitigation

# Q5. Were there medical restrictions on the employee?

Q5. Were there medical restrictions on the employee?

- Branch not on Reason's original tree.
- Branch acknowledges that the physiological state of the individual is an important consideration, but considers it within "the system."
- Question presupposes that if there were restrictions, a medical condition had been reported to and acknowledged by the company.
- This further implies that there may have been medical restrictions imposed on the employee's job duties and tasks.
- **No** – continue to the next branch of the tree.
- **Yes** – proceed to Q6.

# Q6. Were restrictions clearly communicated and understood?



Q6. Were restrictions clearly communicated and understood?

- Follows a “Yes” to Q5.
- Question seeks to determine how well restrictions were communicated to the employee.
- “Communicated” (*to* the employee) is responsibility of company. Need to consult whomever communicated restrictions to employee, or who was responsible for doing so.
- “Understood” (*by* the employee) portion can only be answered with information from both the communicator **and** the employee, and by employee’s behavior.
- So, if the answer to Q5 was “Yes” there are only two possible conclusions, which flow from the answer to Q6.

# Conclusion C4 & Interim Conclusion C5

- If “Yes” to Q6 (restrictions **were** comm’d & understood) → C4. *Disregard of medical restrictions* – company procedures for establishing and enforcing medical restrictions should be initiated.
- 
- If “No” to Q6 (restrictions **not** comm’d & understood) → C5. *System-induced violation* – this was a violation of medical restrictions that were not clearly communicated or understood by the employee.
  - However, influences from the system on behavior also need to be evaluated. Need to apply the substitution test: jump to Q9 (but then stop).

C4. Disregard of medical restrictions.

C5. System-induced violation.

# Q7. Did the employee knowingly violate expectations?

Q7. Did the employee knowingly violate expectations?

- Keep in mind that either the employees actions or the consequences of his/her intended actions were not intended. Degree of influence from organization is significant.
- The key point of this question is to establish the employee's intention with respect to expected behavior.
- Reasonable expectations consist of directions communicated through procedures, policies, work practices.
- If the individual understood (to whatever degree) that his/her actions would deviate from what they knew to be proper or "expected" behavior, then **Yes** – proceed to Q8.
- **No** – continue to the next branch of the tree.

# Q8. Were expectations reasonable, available, workable, intelligible, and correct?

Q8. Were expectations reasonable, available, workable, intelligible, and correct?

- To answer, may need to obtain feedback from the supervisor or even other employees who perform the same task or have similar duties.
- **No** –violation was induced by organizational weaknesses. Nevertheless, because the deviation was intentional, the evaluation should compare the individual's behavior to that of peers.: jump to Q9 (and then stop).
- **Yes** – the problem lies more with the individual. However, further evaluation may still be warranted before drawing a final conclusion about the violation.: jump to Q9 (and then stop).

# Interim Conclusion C6

C6. Possible  
reckless  
violation

- If 'Yes' to Q8 → C6. *Possible reckless violation.* However, just because the individual knowingly violated expectations that were clear and correct, it is not a foregone conclusion that his/her behavior was reckless. Need to consider:
  - how violations were shaped by cost-benefit trade-offs, and
  - the correctness or accuracy of risk perception on the part of the individual involved.

Do substitution test (Q9), then stop.

- If the situation passes the substitution test, this type of behavior is more culpable because reasonable and correct expectations were available **and** others (peers) would not have done the same thing in the same situation.

# Interim Conclusion C7

C7. System-  
induced  
violation

- If 'No' to Q8  $\rightarrow$  C7. *System-induced violation*. Violation was induced by weaknesses in the system.
- Less individual culpability than C6.
- Need to see if situation passes the substitution test.
- Also need to evaluate the system for influences on behavior.

# Q9. Does the situation pass the substitution test?

Q9. Does the situation pass the substitution test?

- We are testing the situation, not the individual.
- “Could have (or has) some well-motivated, equally competent and comparably qualified individual behaved differently under those or very similar circumstances?”
- The answer will probably need to be obtained from “peers” in a manner and environment that will yield frank and honest responses.
- Test will indicate if violations are condoned and/or have become routine.
- If the substitute actor **would** have acted differently (‘Yes’), then the situation **passes** the test; while, if the substitute actor **would not** have behaved any differently (‘No’), then the situation **fails** (does not pass) the substitution test.

# Substitution Test (contd.)

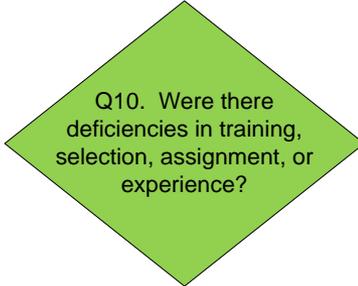
- If situation fails the substitution test, “then the act of apportioning blame has no role to play...” (Neil Johnston)
- Possible paths to the substitution test are:
  - a. from ‘No’ to Q7, i.e. the employee did not knowingly violate expectations.
  - b. from C6 – possible reckless violation
  - c. from C5 – system-induced violation (of medical restrictions)
  - d. from C7 – system-induced violation (of adequate expectations)
- “a” is the only one where you continue to next question or to next branch. For “b,” “c” and “d,” stop, and jump to “Evaluate” block at bottom.



## Q9 contd.

- **Yes** – the situation passes the test.
- **No** – the situation does not pass the test, and the person should not be individually blamed.
- Path from ‘No’ to Q7 (employee did not knowingly violate expectations):
  - If ‘No’ (situation does not pass) → proceed to Q10.
  - If ‘Yes’ (situation passes) → continue to the next branch of the tree.
- Jumps from interim conclusions C5, C6 and C7: results of substitution test determine if conclusion is correct or not.

# Q10. Were there deficiencies in training, selection, assignment, or experience?



Q10. Were there deficiencies in training, selection, assignment, or experience?

- Path to Q10 was an error (individual did not knowingly violate expectations) that did not pass the substitution test.
  - *Training* provides workers the appropriate behavioral skills, related knowledge, and attitudes needed to perform their job duties.
  - *Selection* and *assignment* refer to considerations and processes used to hire people and assign them specific responsibilities and on-the-job tasks.
  - *Experience* is knowledge, skill or practice derived from direct observation of or participation in events.
- **No** – go to conclusion C8
- **Yes** – go to conclusion C9
- **Then, proceed to “Evaluate” block at bottom.**

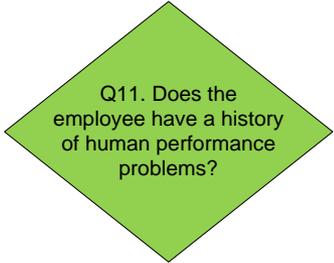
# Conclusions C8 & C9

- If 'No' to Q10 → C8. *Negligent error* – another person (peer) would have foreseen and avoided bringing about the consequence. It suggests more individual culpability than a system-induced error. Corrective action should seek to understand why the individual did not recognize the potential consequence and why he/she believed his/her behavior was appropriate for the situation.
- If 'Yes to Q10 → C9. *System-induced error* – If there was a deficiency in selection and/or assignment, further analysis should focus on the hiring process. Deficiencies in training or experience should analyze the training and qualification process for the individual's job position. Other parts of the system should also be evaluated for related causes.

C8. Possible negligent error.

C9. System-induced error

# Q11. Does the employee have a history of human performance problems?



Q11. Does the employee have a history of human performance problems?

- Path to question is that a peer would have behaved differently under the same or very similar circumstances.
- Need to find out if there have been any previous instances where the individual had this performance problem.
- **Yes** – go to conclusion C10.
- **No** – proceed to question Q12.

# Q12. Was the performance problem self-reported?

Q12. Was performance problem self-reported?

- Not on Reason's original tree.
- Path to is only from a 'No' to Q11 (person has no history of performance problems).
- Self-reporting can be:
  - ❖ in the form of the individual notifying management of an error, or
  - ❖ if the individual acknowledged that an error was made when it was identified or pointed out by a supervisor or co-worker.
- **No** – go to C10.
- **Yes** – go to C11.

# Conclusion C10

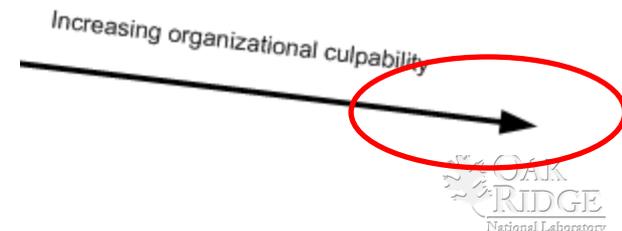
- Reached from either:
  - ‘Yes’ to Q11 (employee has history of performance problems)
  - ‘No’ to Q12 (problem not self-reported)
- **C10. *Blameless error with remediation*** – this was an error. However, the behavior (or history of this type of behavior) may warrant some form of remediation to correct it.
- Determining the performance mode of the error (skill-, rule- or knowledge-based) will serve to indicate the appropriate training or form of remediation needed.
- Analysis of organizational processes and management/supervisory practices should also be conducted.

C10. Blameless error; corrective training or other remediation may be warranted

# Conclusion C11

C11.  
Blameless  
error

- Only reached by ‘Yes’ to Q12.
- C11. *Blameless error* – this was an error; the individual should not be individually blamed.
- The designation of the error as “blameless” reinforces the idea that the individual is not culpable, which only leaves the organization to be blamed for the error and its undesirable consequences.
- Analysis of organizational processes and management/supervisory practices should be conducted to identify conditions that provoked the error and weaknesses in the defenses that did not mitigate the consequences of the error.



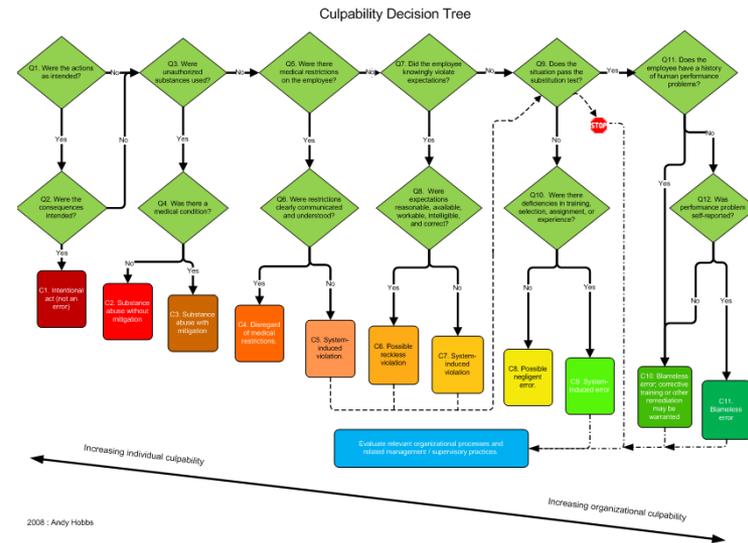
# Evaluate relevant processes...

Evaluate relevant organizational processes and related management / supervisory practices.

- Enhancement not on Reason's original tree.
- If the situation fails the substitution test, “then the act of apportioning blame has no role to play. *Rather we should seek to identify the wider causes of the action.*” (Neil Johnston, emphasis added)
- Driven by conclusions C8, C9, C10 and C11, because there is little to no individual culpability.
- Also reached based on results of substitution test for interim conclusions C5, C6 and C7.
- Not another question; is an instruction associated with a conclusion of a system- or organizationally-induced violation. Need to identify and then evaluate:
  - Relevant organizational processes
  - Related management/supervisory practices

# Summary

- Culpability Decision Tree is a valuable tool for evaluating the culpability of an individual whose involvement in a workplace incident is in question.
- Research project found a number of variations that were determined to be enhancements that strengthen the tool and broaden its applicability.
- Developed a version of the tree that integrates the “best” of the various versions.
- Also developed guidance for each question and conclusion of the tree, as well as improved the structure and aesthetic appearance of the diagram as a whole.



# Case Study 1

- Engineer came in two nights on midnight shift on weekend and installed two small electrical components on a subsystem. Work order had been scheduled for weeks but still had not been completed.
- Component was part of construction project that was high profile enhancement to existing system. Project was way behind schedule and cancellation was being discussed.
- Craft personnel discovered installed components on Monday and found discrepancies on installation.
- Inquiry found that engineer had performed work to “make a point.” Engineer openly admitted how he had performed work.
- Management determined that electrical work was not authorized and was a violation.

# Case Study 2

- On-site shipment of selenium targets made under an invalid exception to requirements of transportation safety document (TSD).
- Shipper applied exception used on a previous shipment when higher dose rates warranted variation from typical.
- Facility owner primarily responsible for ensuring documentation was correct knew requirements yet accepted exception submitted by originator of shipping papers. Did not look up requirements and verify exception.
- Manager of Transportation department is site expert on shipping requirements. Also reviewed documentation and gave no objection to use of exception. Did not refer to TSD to make sure exception could be used.

# Thank you for your attention.

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