MN-ASQ

10 May 2016

Risk Based Thinking and the *Process of Risk Assessment*

(Consolidated for Posting)

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Note to Readers

The presentation deck was tailored for posting as discussed during our meeting May 10, 2016. In some cases content from several slides were consolidated into one. In other cases, pictures were removed and/or content "normalized" for posting.

Caution: Material taken out of context is subject to misinterpretation. Published standards take precedence.

Please contact the author with questions, comments, requests for elaboration and/or presentation to other groups.

– Keith Hornbacher, Keith@HornbacherAssociates.com (17 May 2016)

Purpose:
Raise Awareness + Increase Knowledge

- Getting acquainted (~5 min)
- Context (~15 min with Q&A)
  - Brief walk through the standards as we go
  - Risk, Uncertainty, and the Unexpected
  - Risk-based thinking: what is it?
- Process of risk assessment (~25 min with Q&A)
  - Identification, Analysis, Evaluation
  - Survey results (added after input data processed)
- Risk attitudes, heuristics and biases, cultures (~15 min with Q&A)
- Messages to take away

Please respond with a show of hands . . .

- Managing one or more projects now?
- Are a risk manager/analyst by training and experience?
- Have read ISO 31000:2009, Risk management – Principles and guidelines?
- Private sector?
- Public sector?
- Capital expansion projects?
- Software development?
- Healthcare, medical devices?
- Others?

A little about our journey . . .

- LOG/AN, INC. (LOS ANGELES) 1985 – 1993 EXECUTIVES AND SENIOR ANALYSTS
- HORNBACHER ASSOCIATES (TWIN CITIES) - FROM 1993 ONGOING
  - Founded by Keith Hornbacher and Kristin Hauser
    - *Email: Keith@HornbacherAssociates.com* and *KHauser@HornbacherAssociates.com*
    - *Direct: +1.952.891.3579*
- UNIVERSITY OF PENNSYLVANIA (PHILADELPHIA) - FROM 2005 ONGOING
  - Organizational Dynamics Graduate Studies, School of Arts and Sciences
    - *Affiliated Faculty, Email: keithh@sas.upenn.edu*
  - Graduate Seminars*, Fall 2016
    - *Dynm 605 Managing Operational/Project Risk, Uncertainty, and the Unexpected*
      https://www.sas.upenn.edu/lpscourses/node/4589
    - *Dynm 683 Quantitative Project Risk Analysis Methods and Tools*
      https://www.sas.upenn.edu/lpscourses/node/4601

**Note: some slides are from these courses*

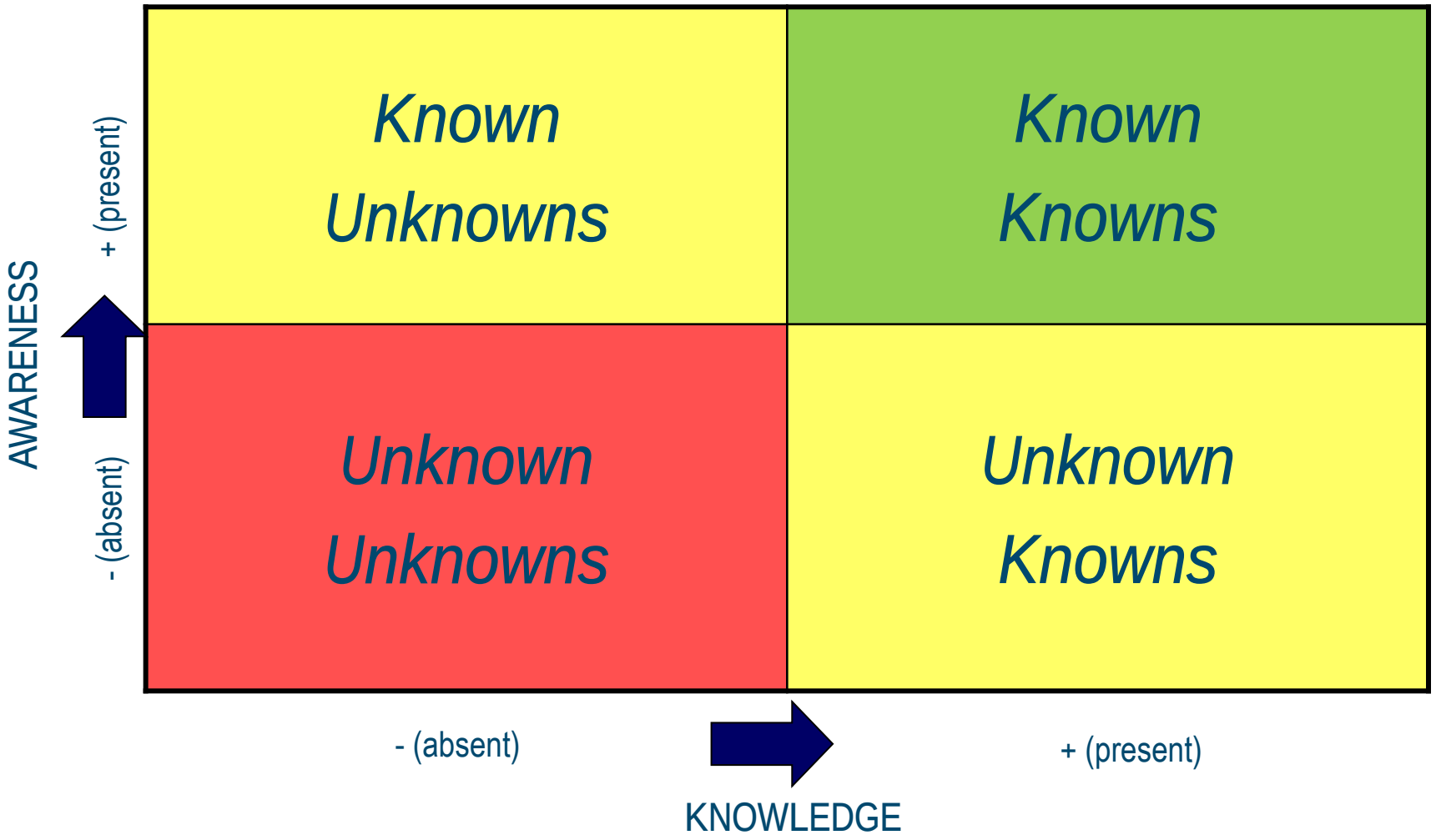
Some case examples from experience . . .

- Hibernia Platform in “Iceberg Alley”
- Oil Sands project in northern Alberta
- NASA missions
- GAO assignments
- FAA Wide Area Augmentation System (WAAS)

What gets us in trouble is not what we don't know. It's what we know for sure that just ain't so.

~ Mark Twain

Increasing awareness and knowledge



What makes events "unexpected"? When are they "unknowable"?

CONTEXT

ASQ / ANSI / ISO related standards, guides

- 9001:2015, Quality management systems – Requirements

  Introduction (page vi) and clause A.4 (page 22)

- 31000:2009*, Risk management – principles and guidelines

- 31010:2009*, Risk management – Risk assessment techniques

  ✓ ISO Guide 73,Risk management – Vocabulary

We will take a brief walk-about in the standards as we discuss them . . .

*Revisions to ISO 31000:2009 and 31010:2009 are reportedly underway.

ISO 13485:2016 – Medical devices

Why was ISO 13485 revised?

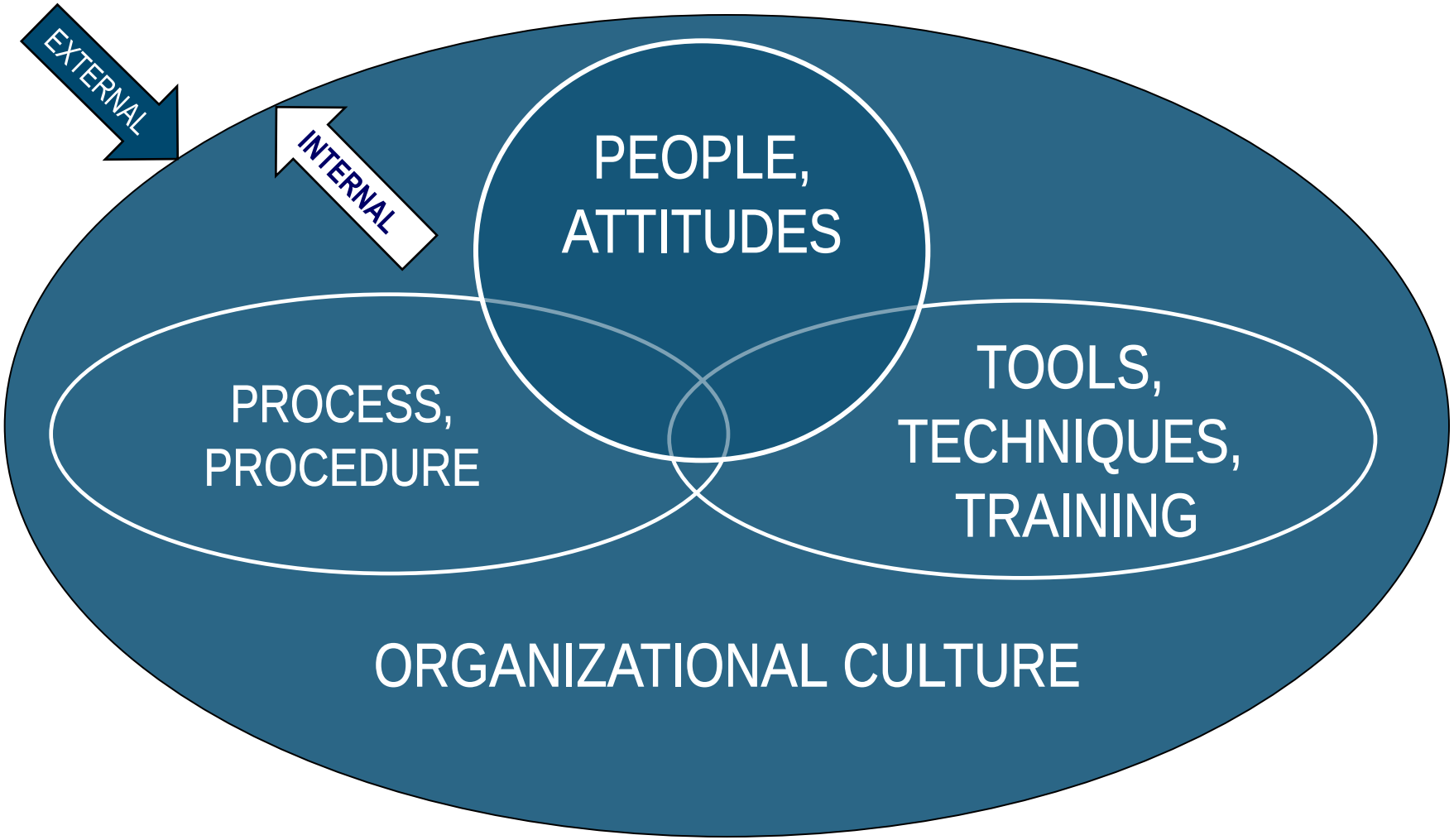
All ISO standards are reviewed every five years to establish if a revision is required in order to keep it current and relevant for the marketplace. ISO 13485:2016 is designed to respond to latest quality management system practices, including changes in technology and regulatory requirements and expectations.

What are the key improvements?

The ***new version has a greater emphasis on risk management and risk-based decision making***, as well as changes related to the increased regulatory requirements for organizations in the supply chain. [*bold red italics added*]

Source: http://www.iso.org/iso/iso13485, downloaded 3 May 2016

Context: organizations are systems of systems



ISO 31000: 2009

"Risk"

2.1 **risk** *effect of uncertainty on objectives*

Notes:

1. An effect is a deviation from the expected — *positive and/or negative*.
2. Objectives can have *different aspects* (such as financial, health and safety, and environmental goals) and can apply at *different levels* (such as strategic, organization-wide, project, product and process).
3. Risk is often characterized by reference to potential *events* and *consequences*, or a combination of these.
4. Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated *likelihood of occurrence*.
5. *Uncertainty* is the state, even partial, of *deficiency of information* related to, *understanding or knowledge* of an event, its consequence, or likelihood.

[emphasis added]

Source: Clause 2.1 Risk, Notes - ISO 31000:2009, pp1-2.

Automatic and quick or conscious and reasoned

- Daniel Kahneman
  - 2002 Nobel Prize in Economic Sciences for pioneering work with Amos Tversky on decision making
  - *Thinking, Fast and Slow**
    - ✓ Fast – intuitive thought (the expert and the heuristic)
    - ✓ Slow – deliberate and effortful

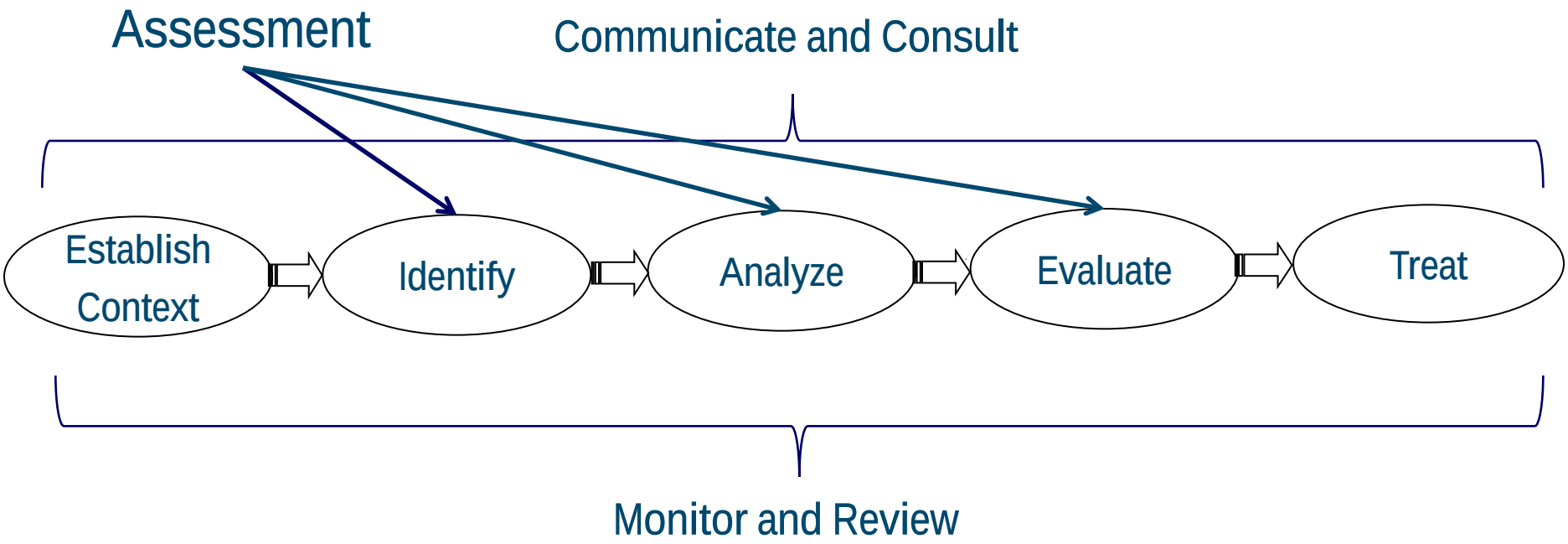
See especially Appendix A – *Judgment Under Uncertainty: Heuristics and Biases* (Tversky and Kahneman, *Science*, 1974) – a landmark work

Assumptions might hurt you!

ISO 31000:2009 Risk Management

- "Effect of uncertainty on objectives"
  - Common terminology?
  - Universal applicability?
  - Challenges to "standards"
  - How do we communicate?
  - Do we hear the same words with different meanings?

Risk Management Process*



*Adapted from Figure 1, ISO 31000:2009, page vii

Challenge: Can all risks/opportunities be identified?

- Paradox of timing – we know the least when we have the most time to influence the future results . . .
- Proactive use of “management space” early enough to have a chance to make a difference
- Management processes may use “*progressive elaboration*”
- Residual, secondary, and emerging risks

How do you implement *that?*

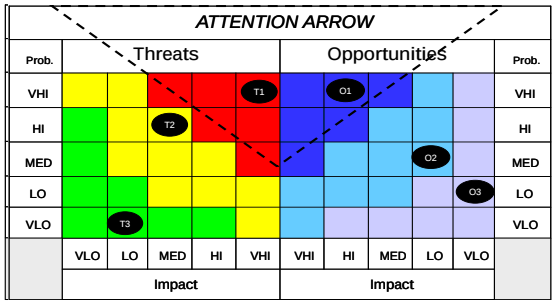
Elaborated Risk Management Cycle (Iterative)

Context

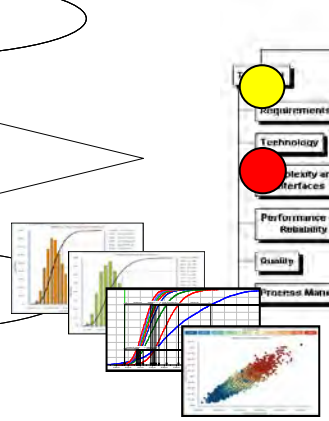
Identify → Listed → Analyze, Evaluate → Prioritized → Treat → Monitor and Review

Risk Register Initial

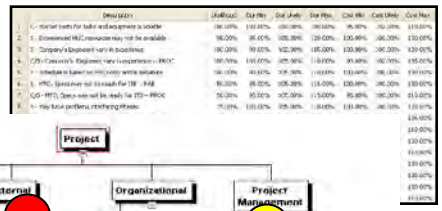
Risk Breakdown Structure (RBS)

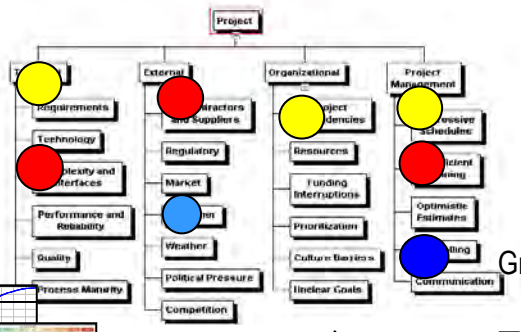


Qualitative → Trigger Criteria? → Quantitative



Risk Register Updated





RBS Risks Grouped

Coordination and Consultation

Identification Example (Risk Register)

10 May 2016 MN-ASQ: Risk Based Thinking and the Process of Risk Assessment										Continues to the right . . .⟶
Risk Identification										
Risk ID	**Short Title**	**Status***	**Date, Source**	**Owner**	**Risk Description Meta Language** [As result of <definite/specific cause>, <uncertain event> may occur, which would lead to <effect on objective(s)>.]	**WBS ele-ment ID**	**RBS ele-ment ID**	**Activity, Unique Task ID**	**Depen-den-cies***	**Type* (Enter O, T Drop down)**
1	Sample 1	New	14-Oct	abc	[Example Risk1: threat evaluated using scale]	1.1.1	1.1.5			T
2	Sample 2	New	14-Oct	def	[Example Risk2: opportunity evaluated using scale]	1.2.1	2.1.5			O

Unless each risk can be described like this . . .

Risk Description Meta Language

[As result of <definite/specific cause>, <uncertain event> may occur, which would lead to <effect on objective(s)>.]

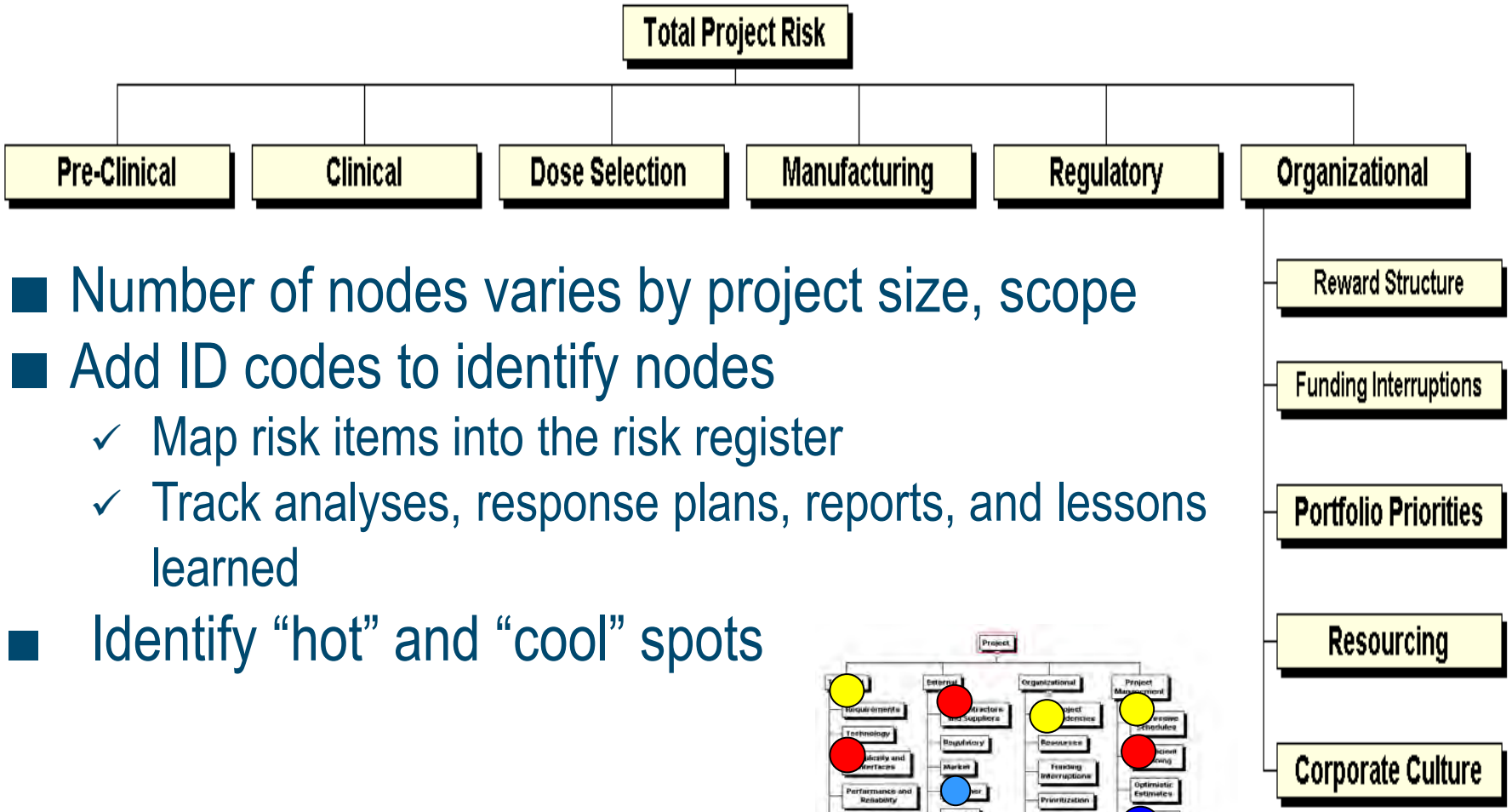
. . . you may not have identified the root cause!!

Risk Breakdown Structure (RBS)
Framework for organizing “risk drivers”

- The RBS appears similar to an organizational chart
- Hierarchy of risk sources or drivers
- This tool provides an effective reference structure for all team members to avoid omission
- An organizational RBS will evolve with succeeding projects
- Specific to types of operations, projects and/or industries
- Excellent for communication and consultation

Risk Breakdown Structure (RBS)

Example of one RBS leg expanded (Pharmaceutical R&D)



- Number of nodes varies by project size, scope
- Add ID codes to identify nodes
  - ✓ Map risk items into the risk register
  - ✓ Track analyses, response plans, reports, and lessons learned
- Identify “hot” and “cool” spots

Qualitative analysis needs definitions for levels and scores

Difficulties with descriptive probability labels

- Purpose of this exercise
  - ✓ Increase awareness of your common terms and phrases to describe probability
  - ✓ Recognize the importance of defining terms to describe likelihood (probability) and impact

Write in your estimates of likelihoods (handout)

Term	Min %	Max %
A good chance		
Almost certain		
Better than even		
Definite		
Highly probable		
Highly unlikely		
Impossible		
Improbable		
Likely		
Possible		
Probable		
Quite likely		
Rare		
Seldom		
Unlikely		

CONTEXT:
Most of us have difficulty associating likelihoods (or probabilities) with words. This exercise illustrates the point. Jot down the first percentages that come to mind . . . They don't improve with "re-thinking".

Survey results: 10 May 2016, n = 39*

Sorted by All Data Mean			
Mean Min	All Data Mean	Mean Max	**Term**
89%	**94%**	**98%**	**Definite**
80%	**88%**	**95%**	**Almost certain**
78%	**85%**	**93%**	**Highly probable**
67%	**75%**	**84%**	**Quite likely**
62%	**69%**	**76%**	**A good chance**
57%	**68%**	**79%**	**Likely**
54%	**66%**	**78%**	**Probable**
50%	**59%**	**68%**	**Better than even**
35%	**53%**	**72%**	**Possible**
9%	**18%**	**27%**	**Unlikely**
9%	**17%**	**25%**	**Highly unlikely**
9%	**17%**	**24%**	**Seldom**
10%	**14%**	**19%**	**Improbable**
7%	**14%**	**22%**	**Rare**
5%	**9%**	**13%**	**Impossible**

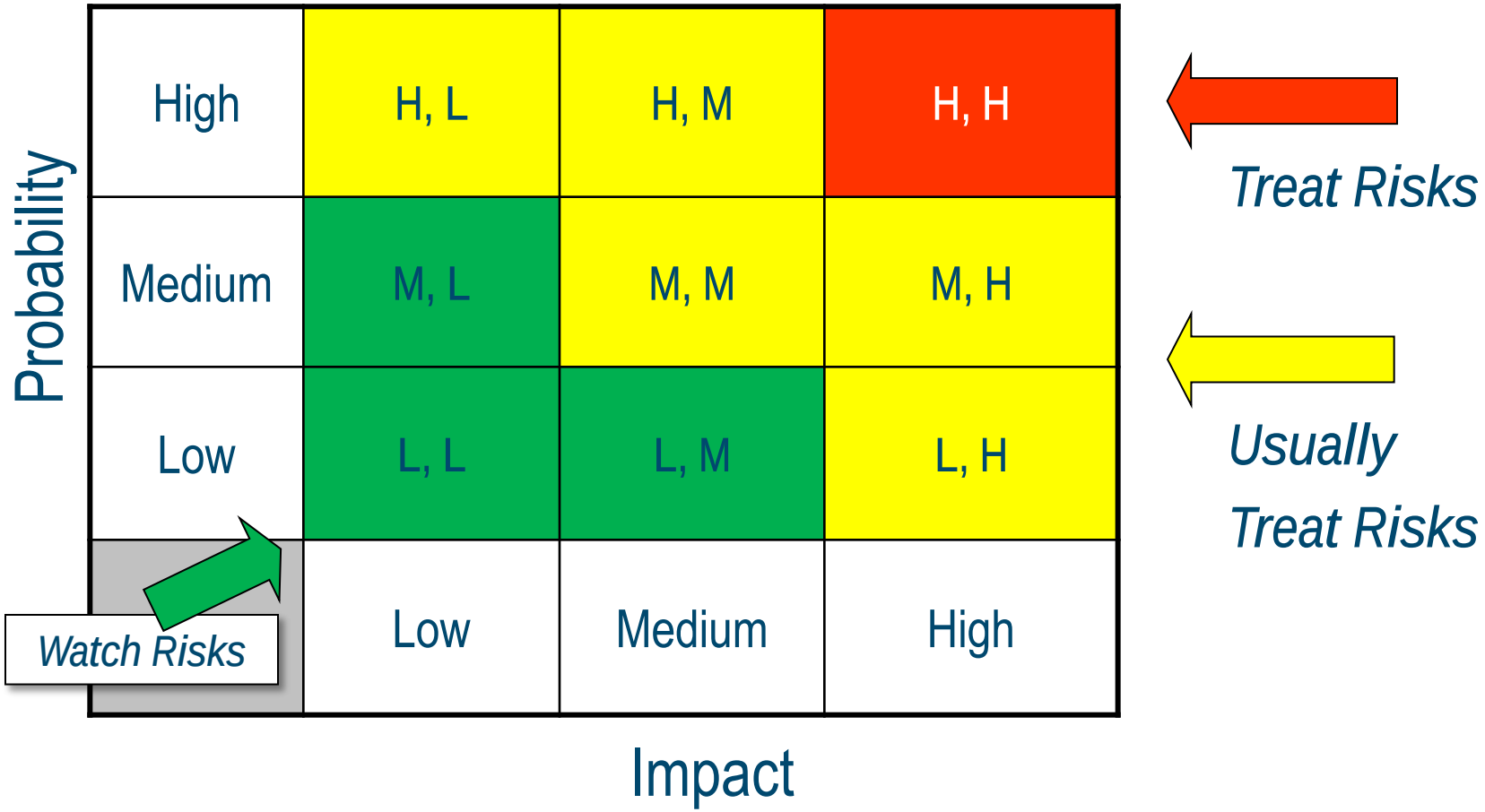
- *Interesting responses (n):*
  - ✓ *Definite*
    - *Min = 100% (14); Max=100% (34)*
  - ✓ *Impossible*
    - *Min = 0% (30); Max=0% (2)*

Two terms, definite and impossible, were included as checks (intended to be 100%, 0%, respectively). MN-ASQ persons who responded to this survey scored better than many other groups polled using the same list.

**39 complete responses (5 partial responses not included in tabuation)*

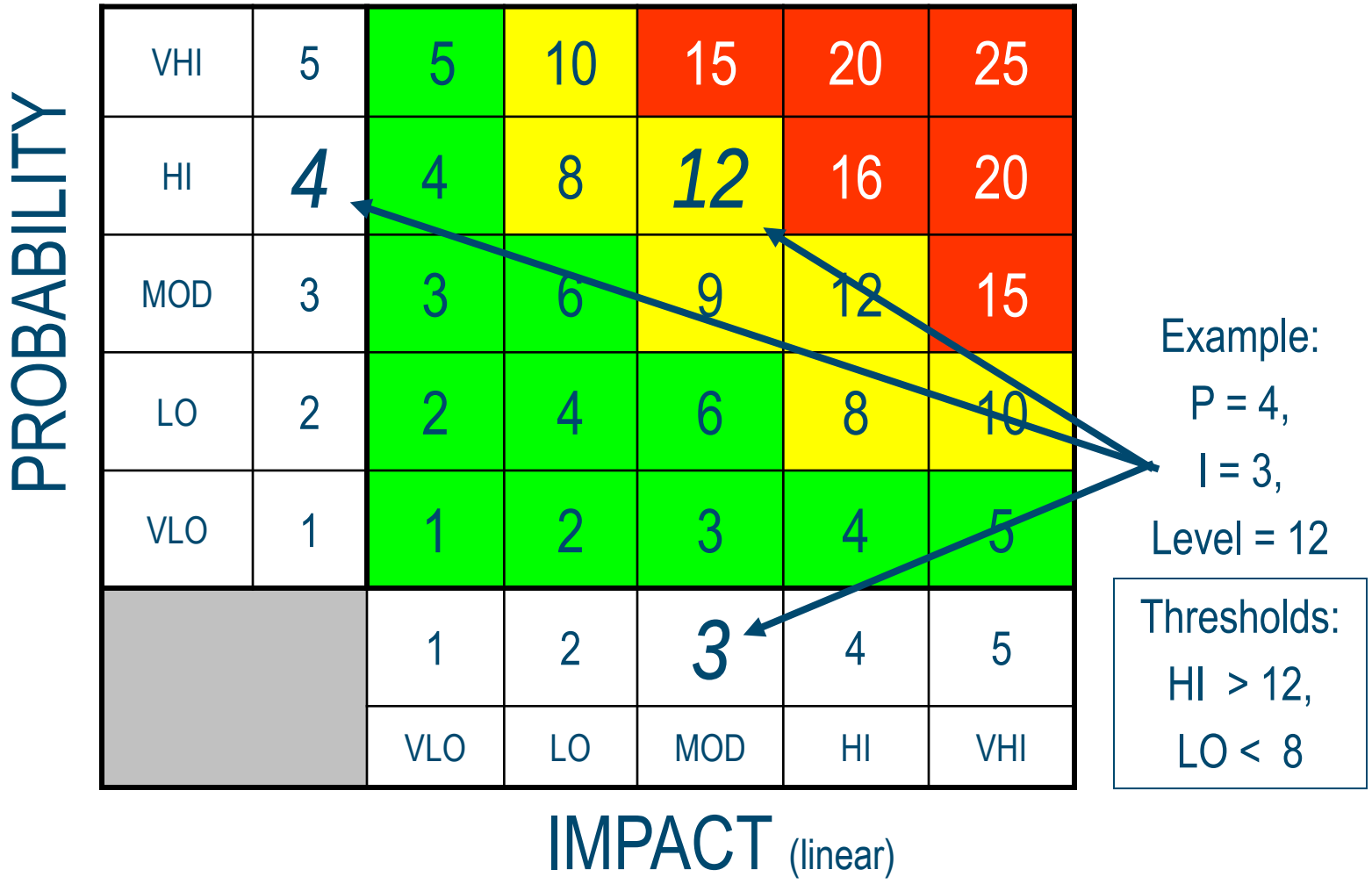
See: *Describing Probability: the limitations of a natural language*

3 x 3 Probability : Impact Grid / Matrix with iso-risks

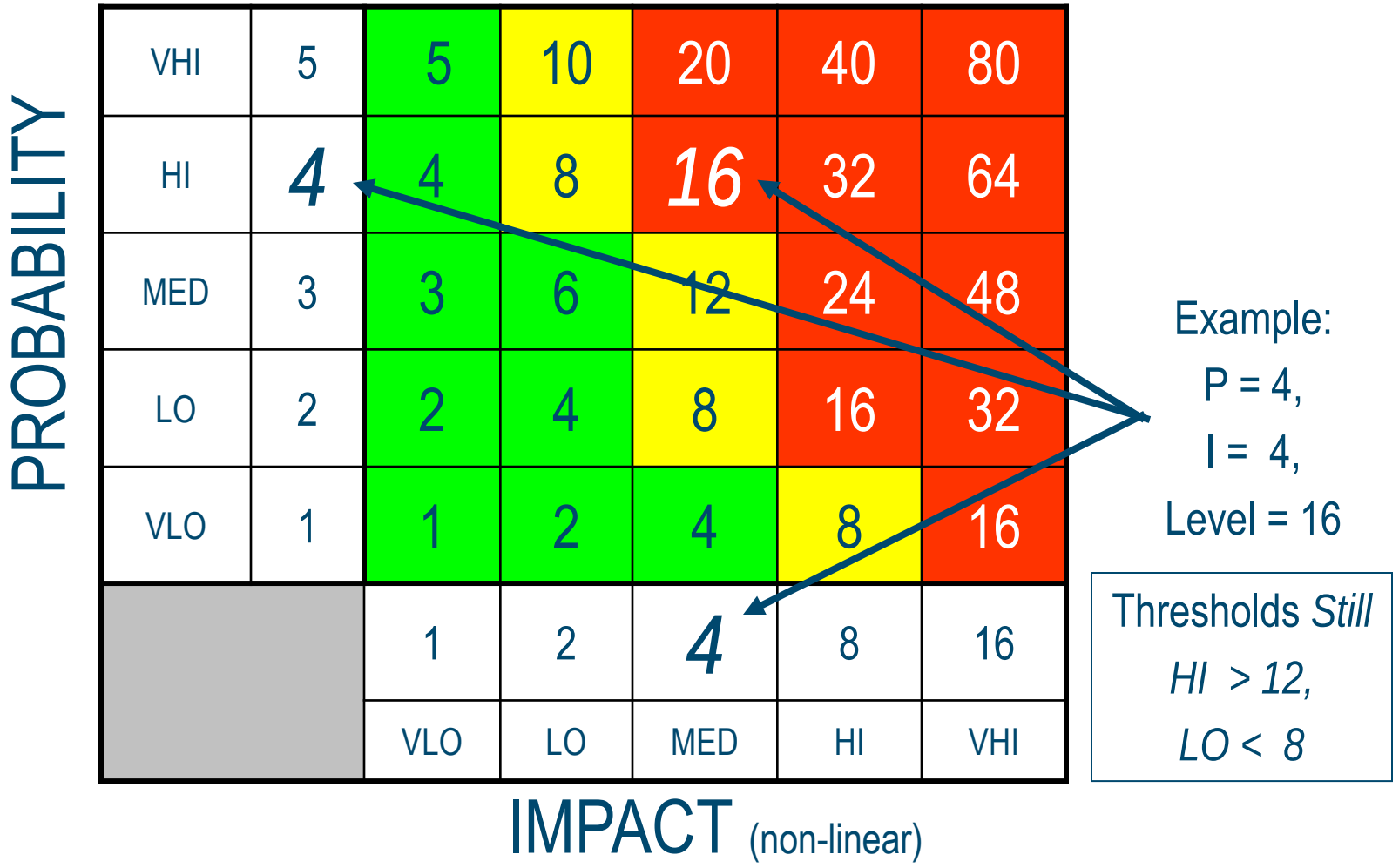


Conventional Qualitative P x I Approach (terms and thresholds need to be defined)

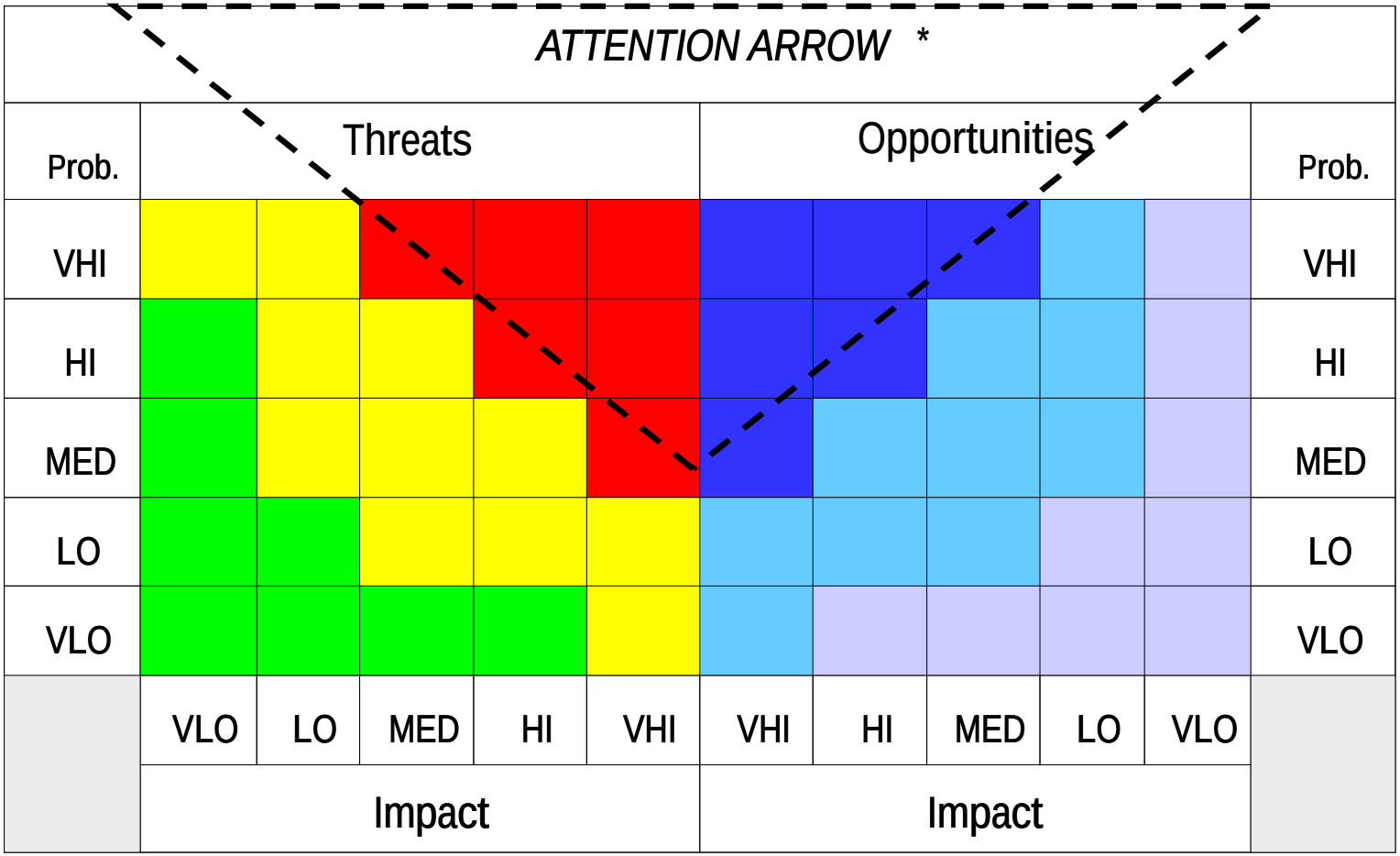
Simple P x I Matrix (linear impact scale)



Impact-averse scale shifts levels of importance
Red Increases, Yellow Decreases



Achieve balance by illustrating both threats and opportunities – known as the "butterfly"



Dynm-605-16c: Adapted from *Project Risk Management Practice Standard*, Figure D12, p89, Project Management Institute, 2009.

*Note: Hillson labeled this region the "Attention Arrow" in *Effective Opportunity Management for Projects, CRC Press, 2004.*

Enhanced risk management: ISO 31000:2009*

- All organizations should aim at the appropriate level of performance of their risk management framework in line with the criticality of the decisions that are to be made.
- Key Outcomes
  - ✓ Organization has current, correct and comprehensive understanding of its risks
  - ✓ Organization's risks are within its risk criteria
- Attributes
  - ✓ Continual improvement
  - ✓ Full accountability for risks
  - ✓ Application of risk management in all decision making
  - ✓ Continual communication
  - ✓ Full integration in organization’s governance structure

*Informative Guidance, adapted from Annex A pages 22-23

Risk Management Maturity Matrix* (see handout)

Observable Characteristics

I. Definition

II. Culture

III. Process

IV. Experience

V. Application

Levels of Maturity

1. Ad Hoc

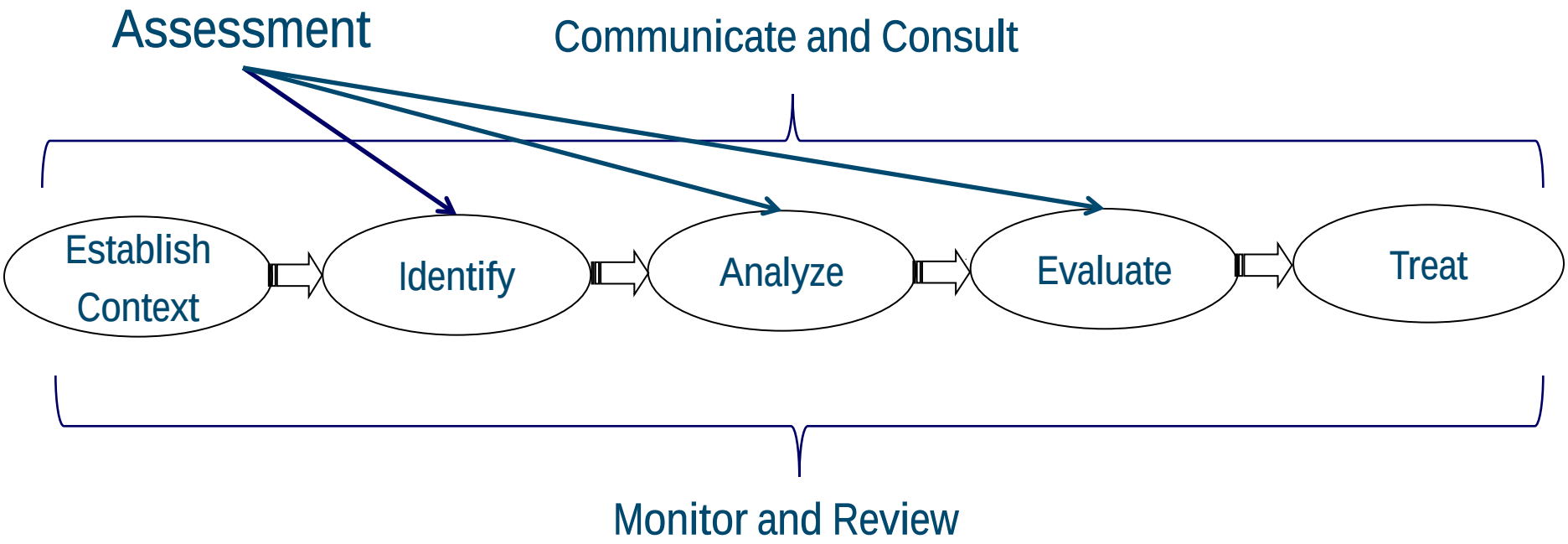
2. Initial

3. Repeatable

4. Managed

*Source: Collaboration Group (INCOSE, PMI, APM) – copies available on request

Recall the Risk Management Process*



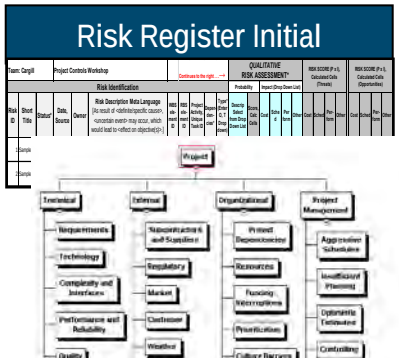
*Adapted from Figure 1, ISO 31000:2009, page vii

Risk Management Cycle
Implements *Risk-Based Thinking* in Decisions

Identify Risks → Listed → **Analyze, Evaluate** → Prioritized → **Treatments**

Root Causes | Assessments | Action Plans

Monitor and Review — Treated



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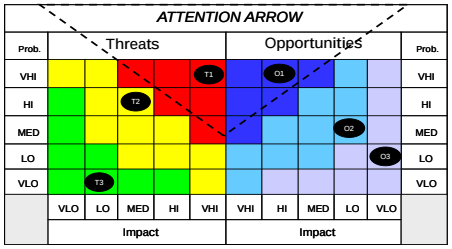
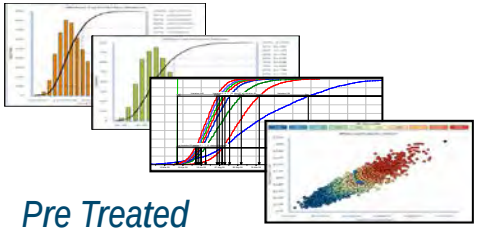
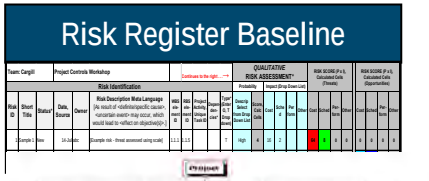
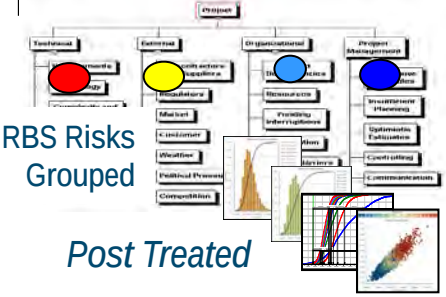




Pre Treated



RBS Risks Grouped



Post Treated

Establish/Maintain Context, Communicate and Consult

Implement Risk Management *Throughout* Project Life Cycle

Truth is ever to be found in simplicity, and not in the multiplicity and confusion of things.

Isaac Newton

Information not discussed during presentation but worth considering

Quantitative Risk Analysis using *Simulation*

Please contact authors for information

Roll of leadership

How important are leaders of organizations?

Some look good and say the right things!

our vision

Enron's vision is to become the world's leading energy company – creating innovative and efficient energy solutions for growing economies and a better environment worldwide.

our values

respect

We treat others as we would like to be treated ourselves. We do not tolerate abusive or disrespectful treatment. Ruthlessness, callousness, and arrogance don't belong here.

integrity

We work with customers and prospects openly, honestly, and sincerely. When we say we will do something, we will do it; when we say we cannot or will not do something, then we won't do it.

communication

We have an obligation to communicate. Here, we take the time to talk with one another... and to listen. We believe that information is meant to move and that information moves people.

excellence

We are satisfied with nothing less than the very best in everything we do. We will continue to raise the bar for everyone. The great fun here will be for all of us to discover just how good we can really be.

But are not trust *worthy*!

On the other hand . . .

Good leaders seek the opportunity to learn

. . . I'm grateful for the advice my parents always gave me about working hard, admitting what you don't know and not being afraid to ask for help. Assume the good in people and be prepared to learn from everyone. More often than not, your colleagues and team will help you succeed !

- Mary Barra CEO, General Motors Company

See: https://www.linkedin.com/in/mary-barra-29469712?trk=pulse-det-athr_prof-art_hdr
Downloaded May 3, 2016

Messages to take home

- Risk Management using best practices proven to work
- *Risk-Based Thinking* likely to increase organizational resilience and success
- Risk attitudes and cultures influence organizational behavior
- People resources can be trained in methods and tools
- Effective leaders listen and learn (PDCA)
- We only scratched the surface here . . . !

A visualization to help remember context

Downey or Hairy Woodpecker?

MN-ASQ

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