

RISK STEWARDSHIP: HOW TO SELL "IT"

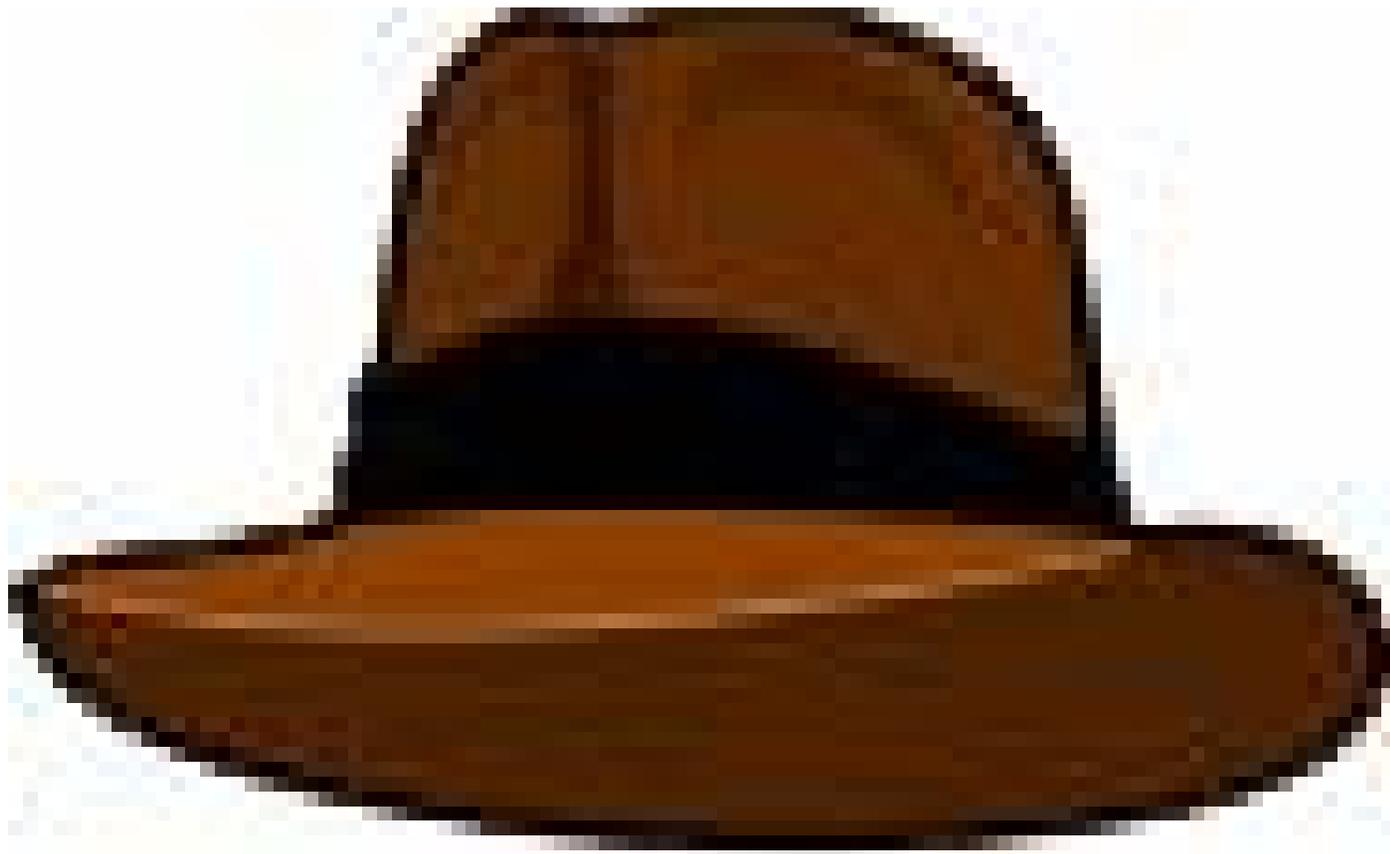


Kenneth W. Proper
3rd Annual DoD Safety and Health Forum
16 October 2007
Hyatt Regency McCormick Place,
Chicago, Illinois

Theme

The presenter believes that *stewardship theory* and *decision theory* offer safety practitioners as risk analysts a means of selling their *risk concerns* to leadership.

Change of hats



Purpose

- History of Risk Management
- Current Status
- Stewardship Theory Versus Agency Theory
- Decision Making Process and Utility Functions
- Putting It All Together

A Brief History of Risk Management

- 430 BC –
managemen
- Pericles's
of the Pe
431 BC
- 400 BC –
– Roman
- Fortuna –



practice risk

ation in *History*
war, around

-City States

Chance

A Brief History of Risk Management

- 500 CE – 1500 CE Medieval Period
 - Catholic Church
 - Crusades - *al zhar*, the Arabic word for dice
- 1500 CE – 1600 CE – Renaissance Period
 - 1552, Cardano proposed the concept of odds

A Brief History of Risk Management

- 1700 CE – 1800 CE Age of Enlightenment
 - In 1713, Jacob Bernoulli - *Ars conjectandi* (The art of conjecture)
 - 1724 Daniel Defoe's *Roxana or the fortunate mistress*

A Brief History of Risk Management

- In 1730, Abraham De Moivre published *Doctrine of Chances*
- 1763 Thomas Bayes – *An Essay towards solving a Problem in the Doctrine of Chances*

A Brief History of Risk Management

- 1800 CE– 1960 CE Realism
 - 1830s – Statistics recognized
 - 1865 - Gauss – Deviation from Mean
 - 1878 – Railroads
 - 1959 – Stovic begins risk research

A Brief History of Risk Management

- 1960- Modern Period
 - Early 1960s – first risk management texts published
 - 1964 – Journal of Risk and Insurance
 - Early 1970s Health Care Facilities

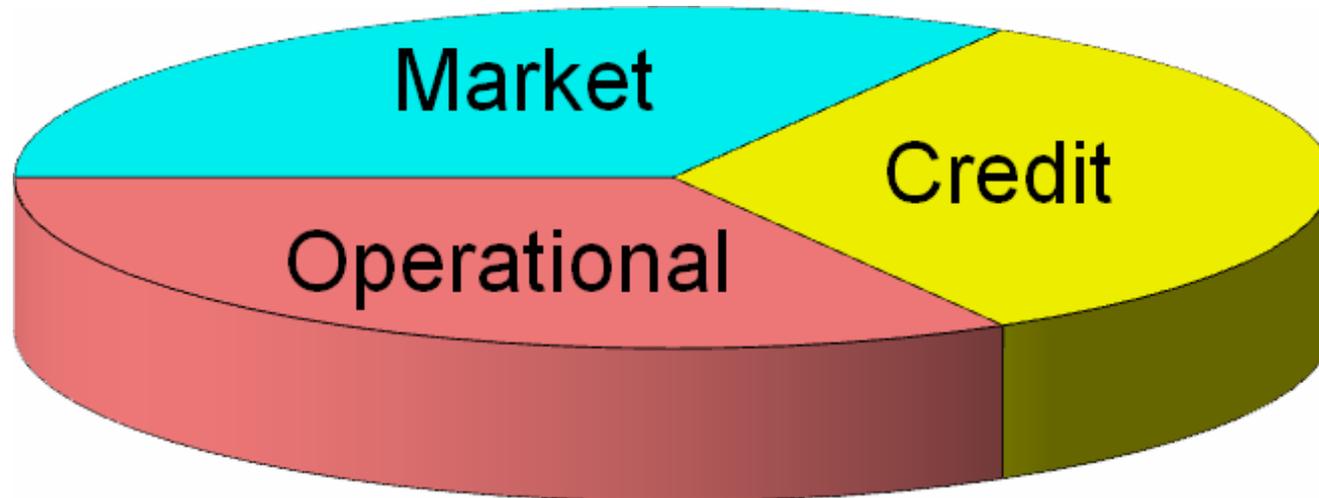
A Brief History of Risk Management

- 1973, USFDA – *Sensitivity of method* regulations
- 1975, NRC - first probabilistic risk analysis
- 1985 – Insurance Crisis
- 1990 – Army introduces RM

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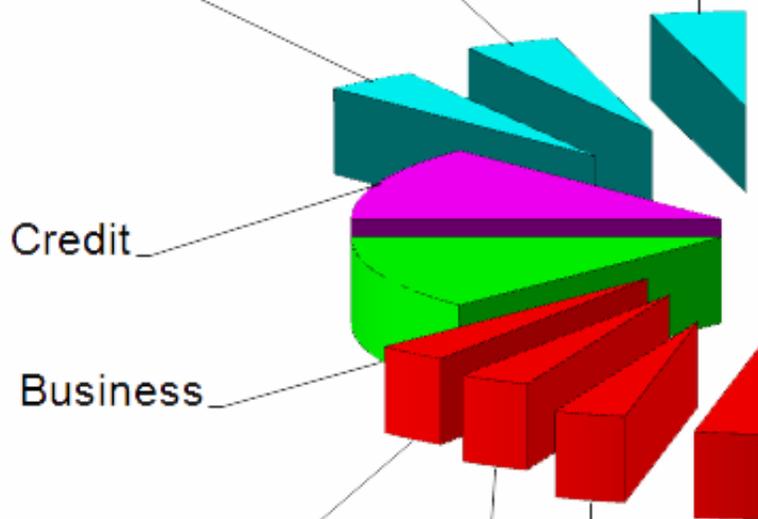
Typology of Risk Management



Typology

Operational Risk

Fraud Technology Human Factor



Credit

Business

Strategic Risk

Credit Risk

Liquidity Risk

Legal & Regulatory

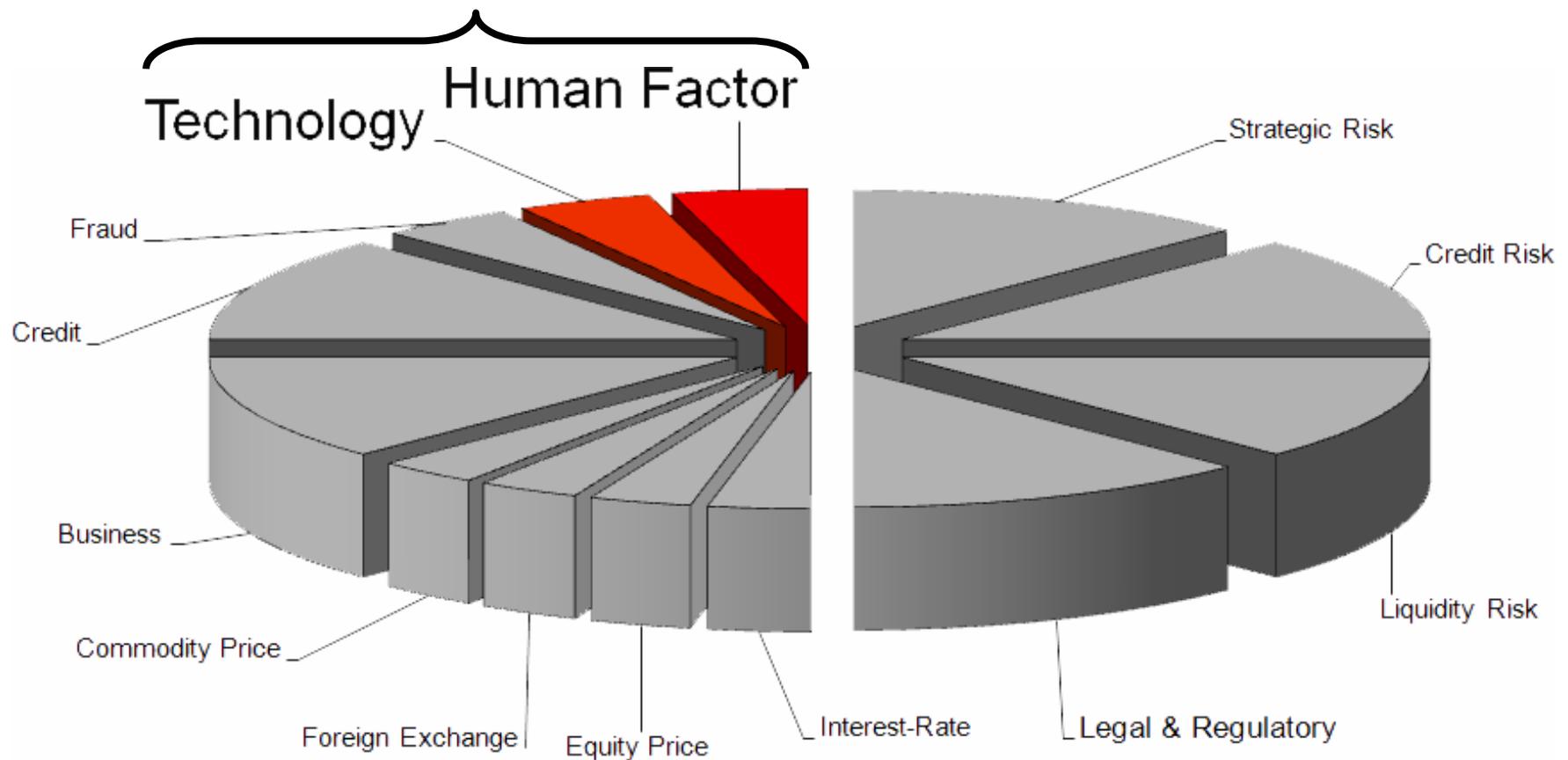
Commodity Price

Foreign Exchange Equity Price Interest-Rate

Market Risk

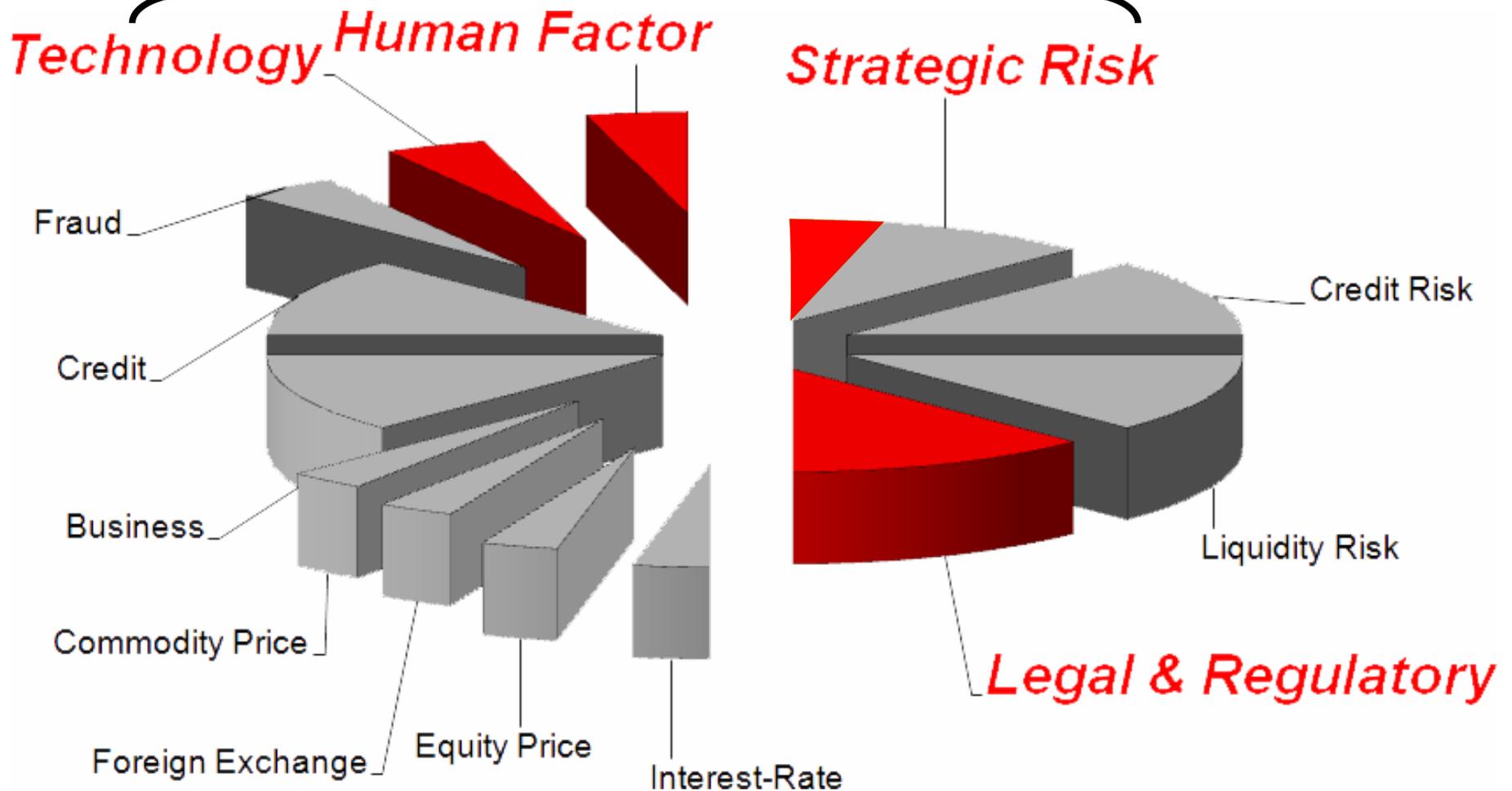
Typology

Operational Risk



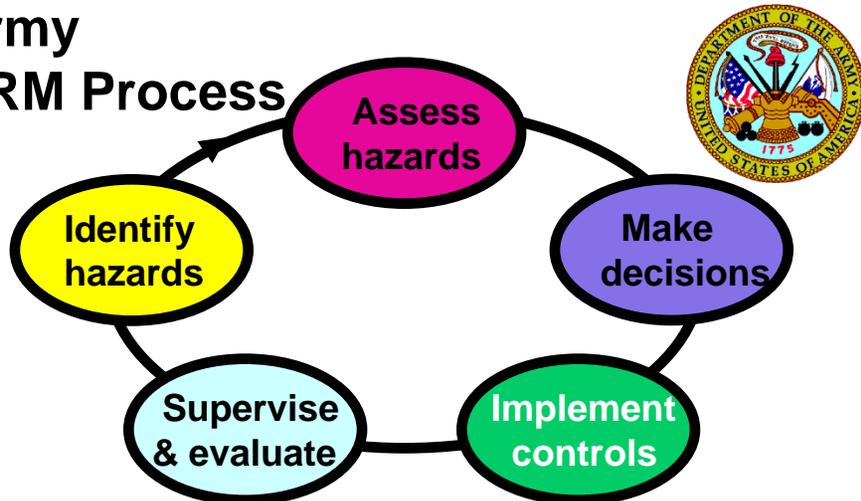
Proposed Typology

Operational Risk



Which One to Use?

Army CRM Process



Air Force ORM Process



Risk Identification



Risk Assessment



Risk Analysis & Mitigation

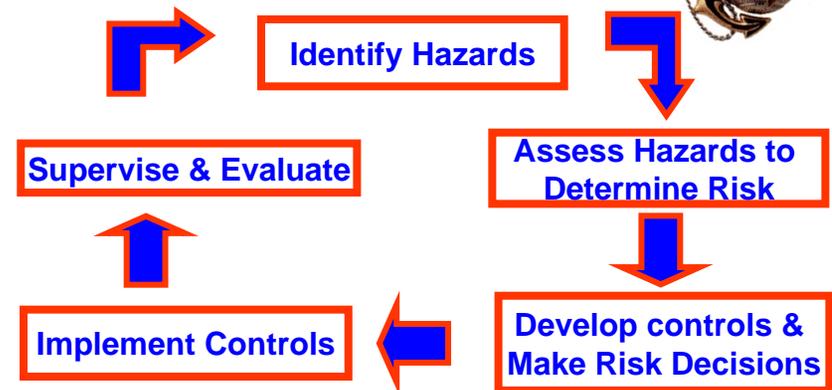


Risk Tracking



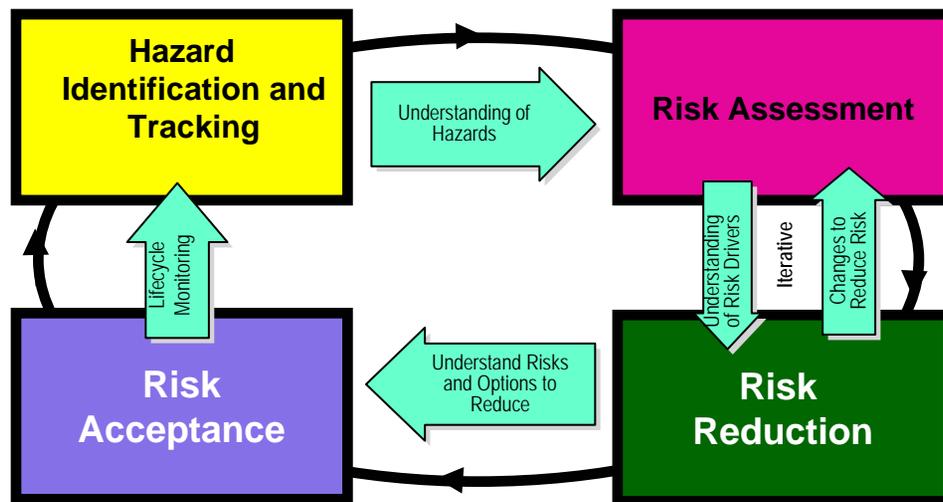
Navy Critical Process Risk Management

Marine Corps



Which One to Use?

System Safety Risk Management Process



President's Commission on Risk Management Process



Risk Management (RM)

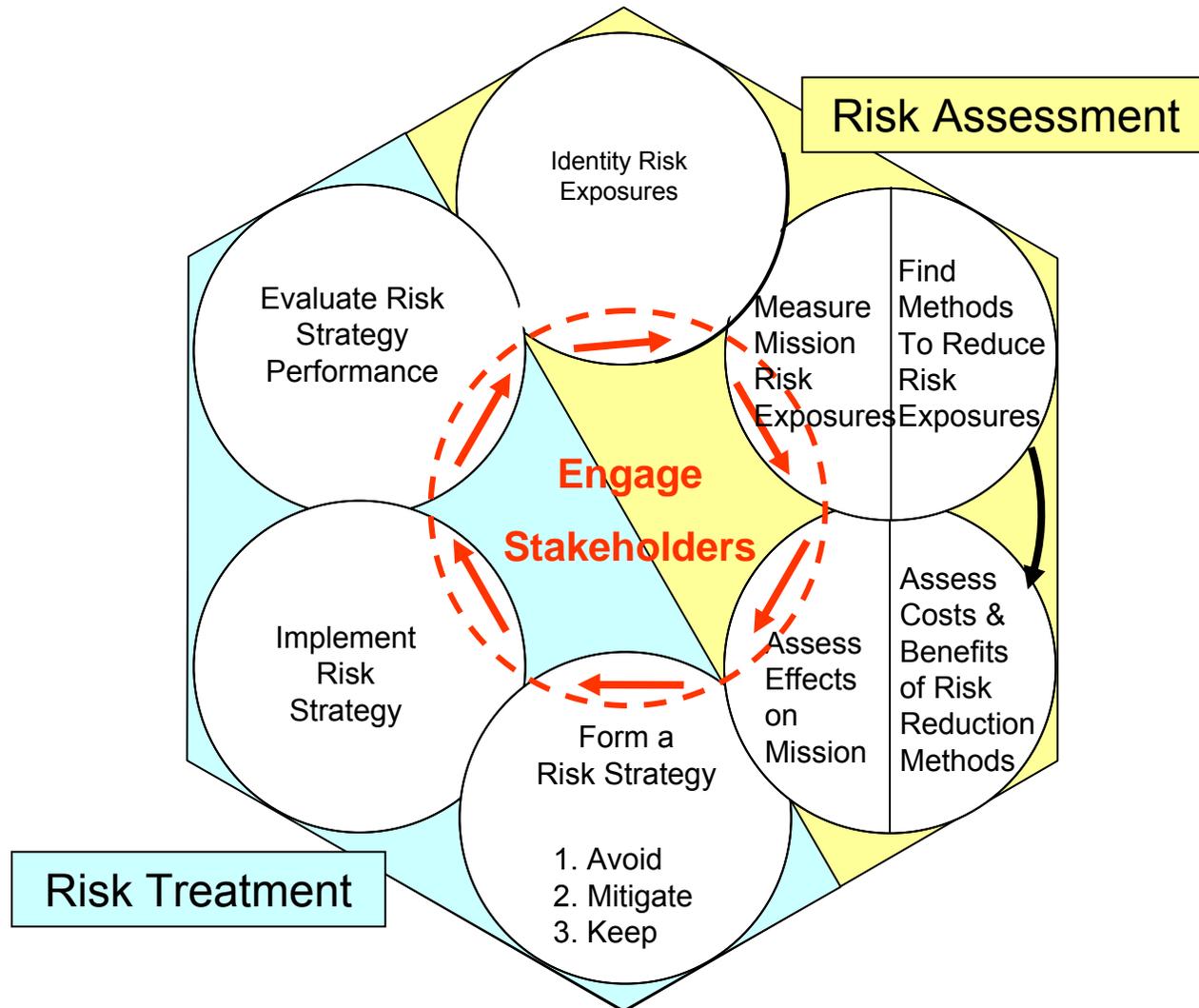
Coordinated activities to direct and control an organization with regard to *risk*

RM Goal

The goal of RM is to assist leaders in making

- Informed decisions
- Risk strategy

Proposed Risk Management Model



Purpose

- History of Risk Management
- Current Status
- **Stewardship Theory Versus Agency Theory**
- Decision Making Process and Utility Functions
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Agency Theory

- In an agency relationship, one party acts on behalf of another.
- Assumes that the agent is a *rational actor* – Adam Smith argues this point in 1776 as the underpinning of the capitalist systems

Agency Theory

- A rational actor is one who
 - Has identified what he or she wants,
 - Is capable of ordering those wants from most preferred to least preferred, and
 - Acts in ways that he or she believes will maximize satisfaction of preferences

Agency Theory

- Both the agents and principals in agency theory seek to receive as much possible benefit with the least possible expenditure.
- Assumes that the interests of the principal, and the stakeholders will not be best served by the agent, the manager and/or employee.

Stewardship Theory

- Defines situations in which managers are not motivated by individual goals
- Become stewards whose motives are aligned with the objectives of their principals.
- The interests of agents and principals are not in conflict

Stewardship Theory

- A steward will not substitute or trade self-serving behaviors for cooperative behaviors.
- Stewards develops a strong relationship between the success of the organization and the principal's satisfaction.

Risk Stewardship

- "Risk" is "different" in public services.
- Public sector managers are held accountable more publicly than their counterparts in the private sector

Risk Stewardship

An organizational philosophy whereby a risk practitioner becomes a risk steward protecting and maximizing organizational performance by coordinating activities to direct and control an organization with regard to *risk*

Purpose

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- **Decision Making Process and Utility Functions**
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Decision Making

- Decision-making is a fundamental part of the management process, influenced by several factors.
- To reach mission goals, leaders and commanders consider only a limited number of decision alternatives.

Decision Making

- Factors affecting the decision-making process is whether the decision involves
 - Short-term operating controls,
 - Periodic control decisions, or
 - Long-term operating controls.

Decision Making

- A decision-maker makes a decision
 - Under risk;
 - Under uncertainty; or
 - Under ignorance

Decision Making

Decision model:

1. Identification of the problem;
2. Obtaining necessary information;
3. Production of possible solutions;
4. Evaluation of such solutions;
5. Selection of a strategy for performance;
and
6. Implementation of the decision

Utility Function

- The leader or commander must try to obtain
 - As good an outcome as possible, and
 - To do this, needs to choose based on a certain standard of what is good and what is bad.

Utility Function

- The decision-making process must rely on such a standard at hand then proceeds to express this standard in a precise and useful way by providing the leader or commander with information to select between alternatives.
- One method of doing this is by valuing the alternatives.

Utility Function

- Consider the decision between three options, Option A, Option B, and Option C.
- Option A is better than Option B based on the value system selected.
- Option B is better than Option C using the same value system.

Utility Function

Therefore:

- A is better than B or $A > B$;
- B is better than C or $B > C$;
- Hence, A is better than C or $A > C$.

Utility Function

Decision Table

Cost

Option A	\$500.00
Option B	\$600.00
Option C	\$700.00

Utility Function

Decision Table

Option	Cost	Quality
A	\$500	Good
B	\$600	Fair
C	\$700	Excellent

Utility Function

Consider that the decision-maker wants to know more about the alternatives. Such as:

- Cost
- Quality
- Delivery time
- Reliability
- Safety
- Replacement parts
- Compatibility
- User-ability
- Weight
- And so on

Utility Function

- Develop a value system
- Value system built to the decision-maker's needs and values
- For instance:

$$EU(A) = \sum_{i=1}^n P(E_i)U(X_i)$$

Quality	Factor
Excellent	1.0
Good	.75
Fair	.50
Poor	.25

Utility Function

Decision Table

Option	Cost	Quality	Safety	Delivery Time	Utility
A	1.00	0.50	0.85	0.95	0.4038
B	0.90	0.75	0.95	0.74	0.4745
C	0.80	1.00	0.90	0.87	0.6264

RM Utility Function & Decision Making

Factors to consider with an identified hazard:

- Effect on mission
- Effect on facilities
- Number of possible fatalities – Related and public
- Number of possible serious injuries – Related and public
- Number of possible minor injuries – Related and public
- Environmental Damage

RM Utility Function

Impact Area		Current Risk	New Risk	CA 1	CA 2	Δ Risk
Effect on mission		5.00	6.00	5.25	5.95	1.00
Effect on facilities		4.30	7.50	4.75	7.25	3.20
Number of possible fatalities	Related	2.50	3.40	2.65	2.55	0.90
	Public	1.25	2.50	1.30	1.30	1.25
Number of possible serious injuries	Related	3.20	3.85	3.20	3.60	0.65
	Public	1.75	2.35	2.00	2.50	0.60
Number of possible minor injuries	Related	3.60	4.25	4.14	3.66	0.65
	Public	2.10	2.95	2.65	2.25	0.85
Environmental Damage		5.50	7.45	6.50	5.50	1.95
Total Disutility		29.20	40.25	32.44	34.56	11.05
Δ Risk			11.05	3.24	5.36	

Function

Impact Area	
Effect on mission	
Effect on facilities	
Number of possible fatalities	Related
	Public
Number of possible serious injuries	Related
	Public
Number of possible minor injuries	Related
	Public
Environmental Damage	
Total Disutility	
Δ Risk	

	Current Risk	New Risk	CA 1	CA 2	Δ Risk
	5.00	6.00	5.25	5.95	1.00
	4.30	7.50	4.75	7.25	3.20
1	2.50	3.40	2.65	2.55	0.90
	1.25	2.50	1.30	1.30	1.25
1	3.20	3.85	3.20	3.60	0.65
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Δ RISK

RM Utility Function

New Risk

6.00

7.50

3.40

2.50

3.85

2.35

4.25

2.95

7.45

40.25

11.05

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Δ Risk

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3.20

0.90

1.25

0.65

0.60

0.65

0.85

1.95

11.05

Δ Risk

1.00

3.20

0.90

1.25

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RM Utility

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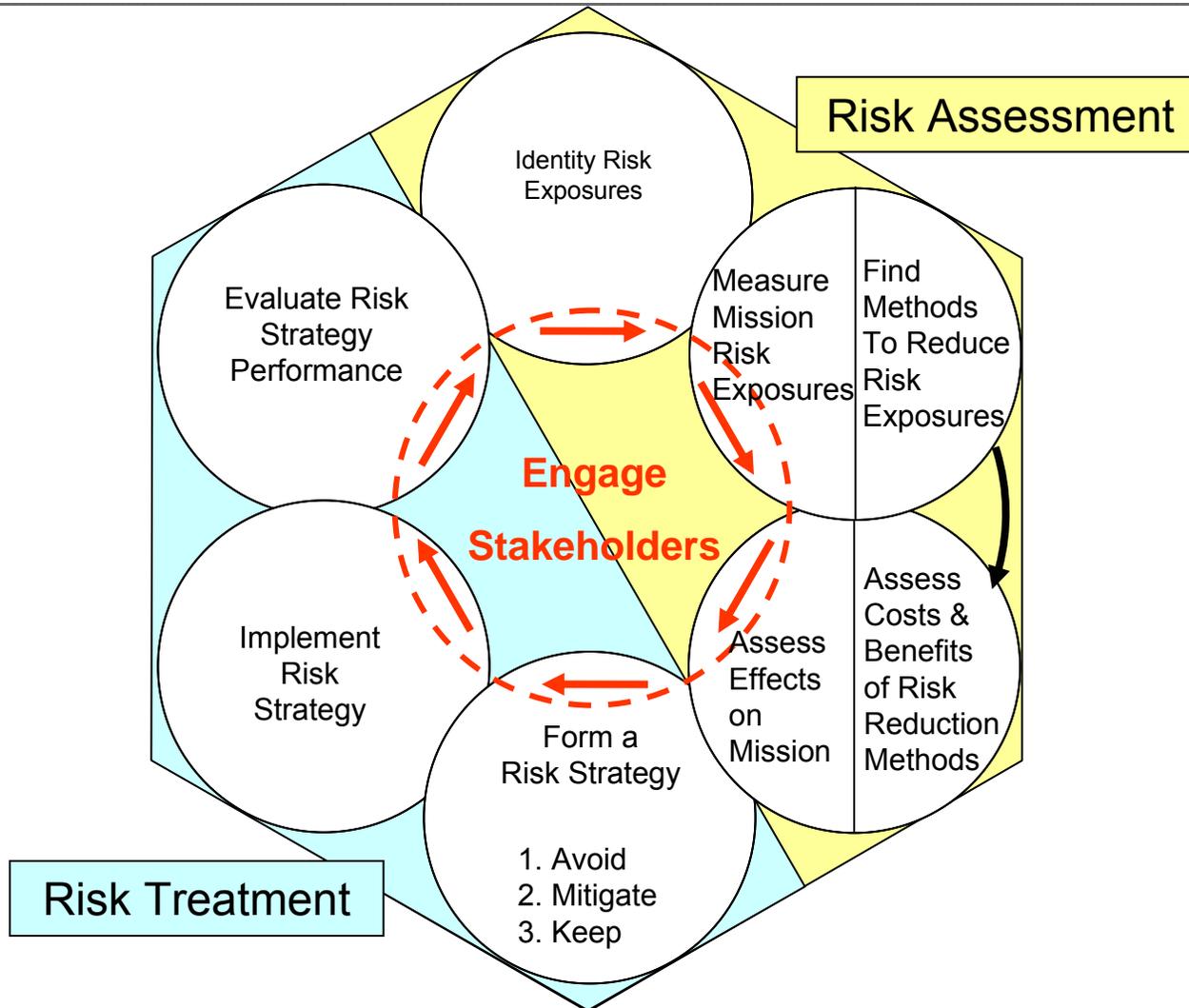
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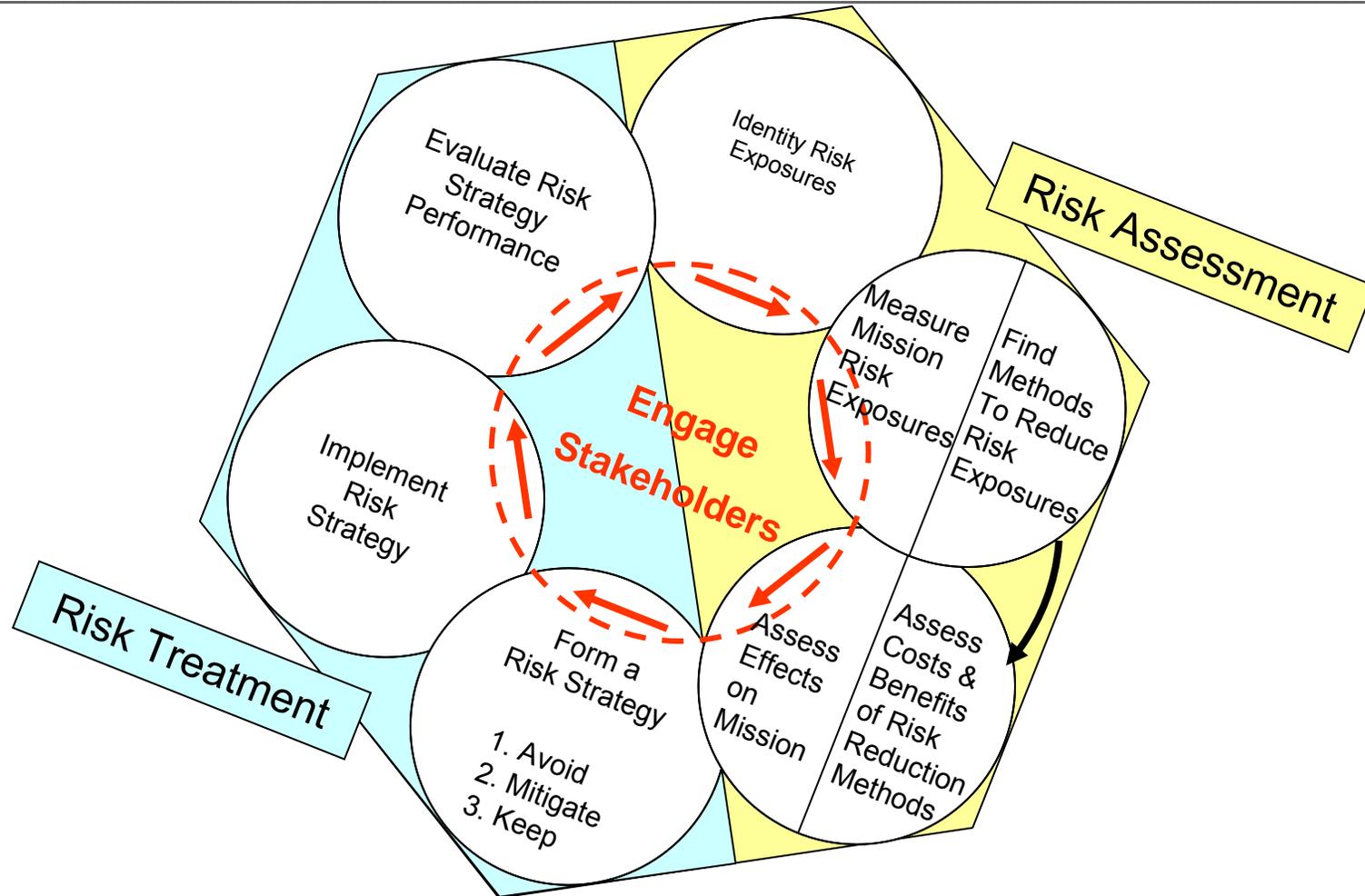
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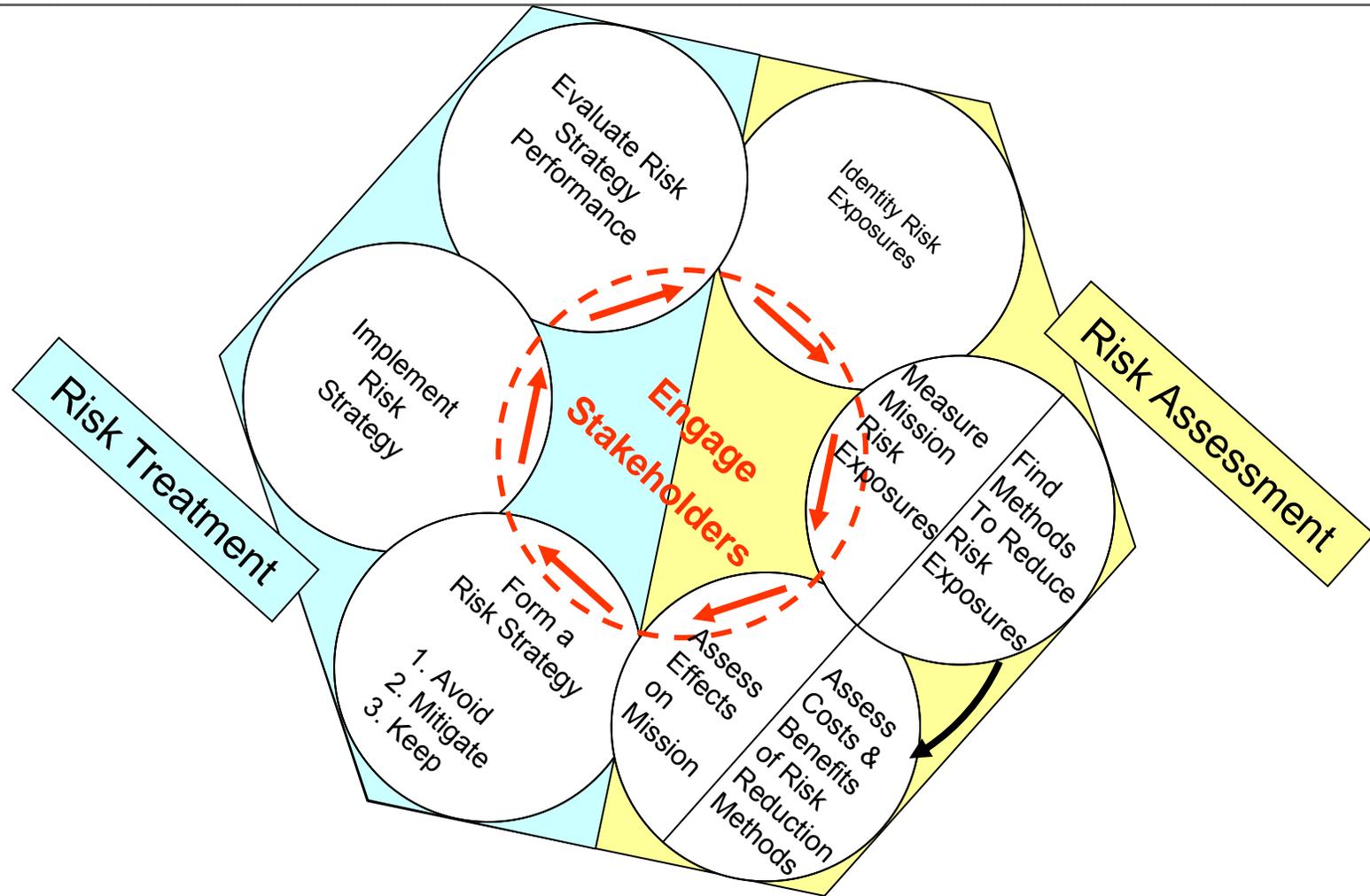
Risk Management Process



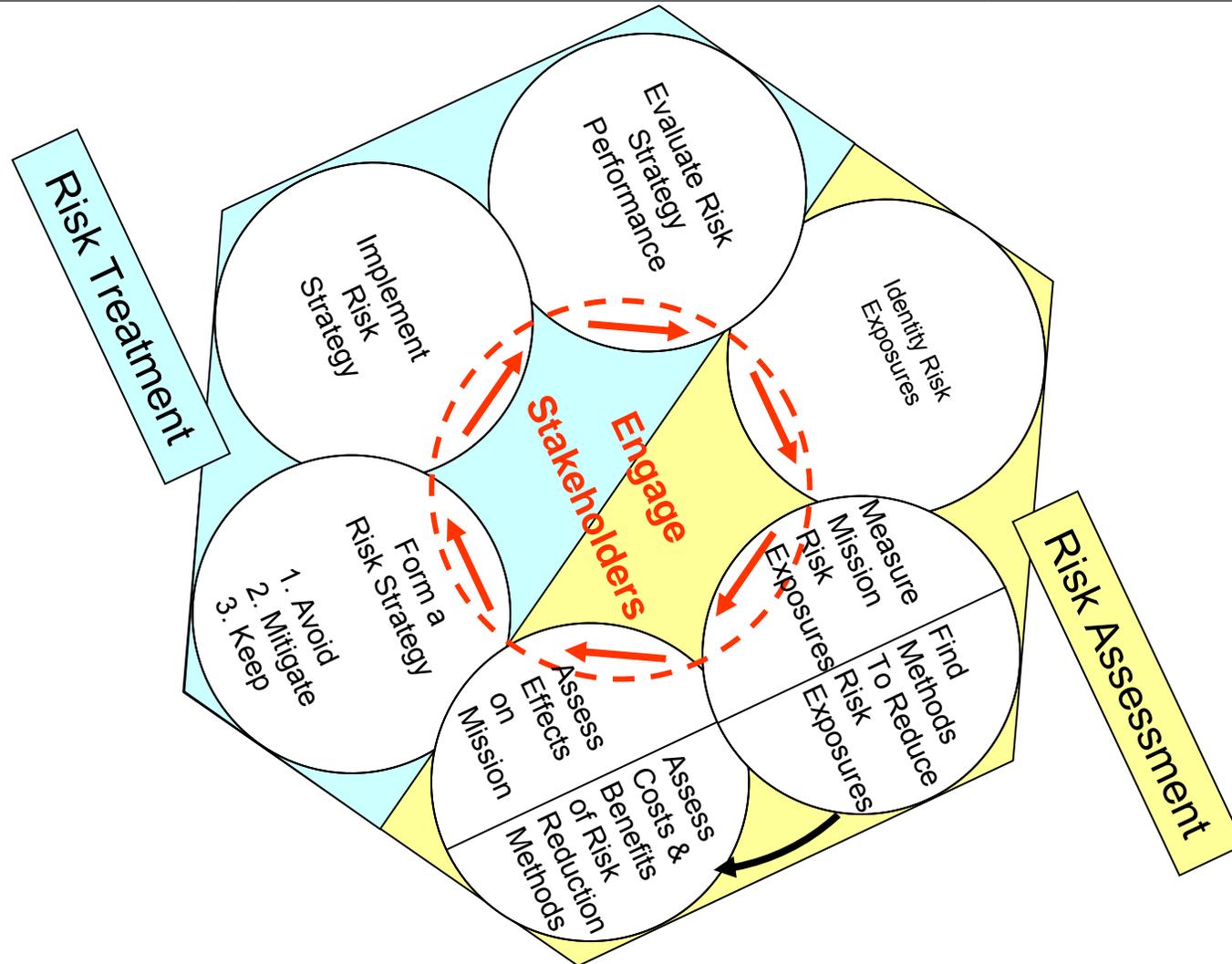
Risk Management Process



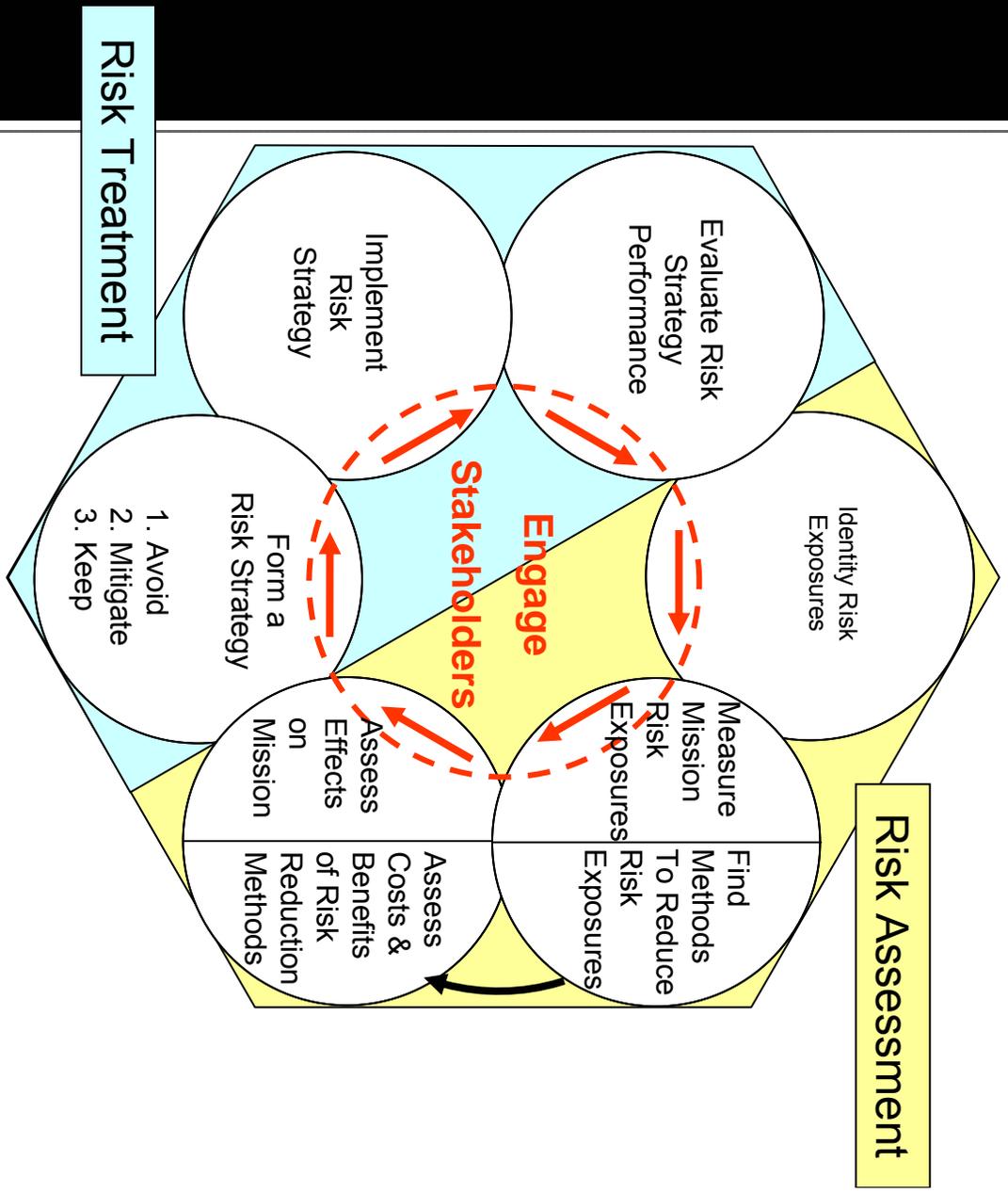
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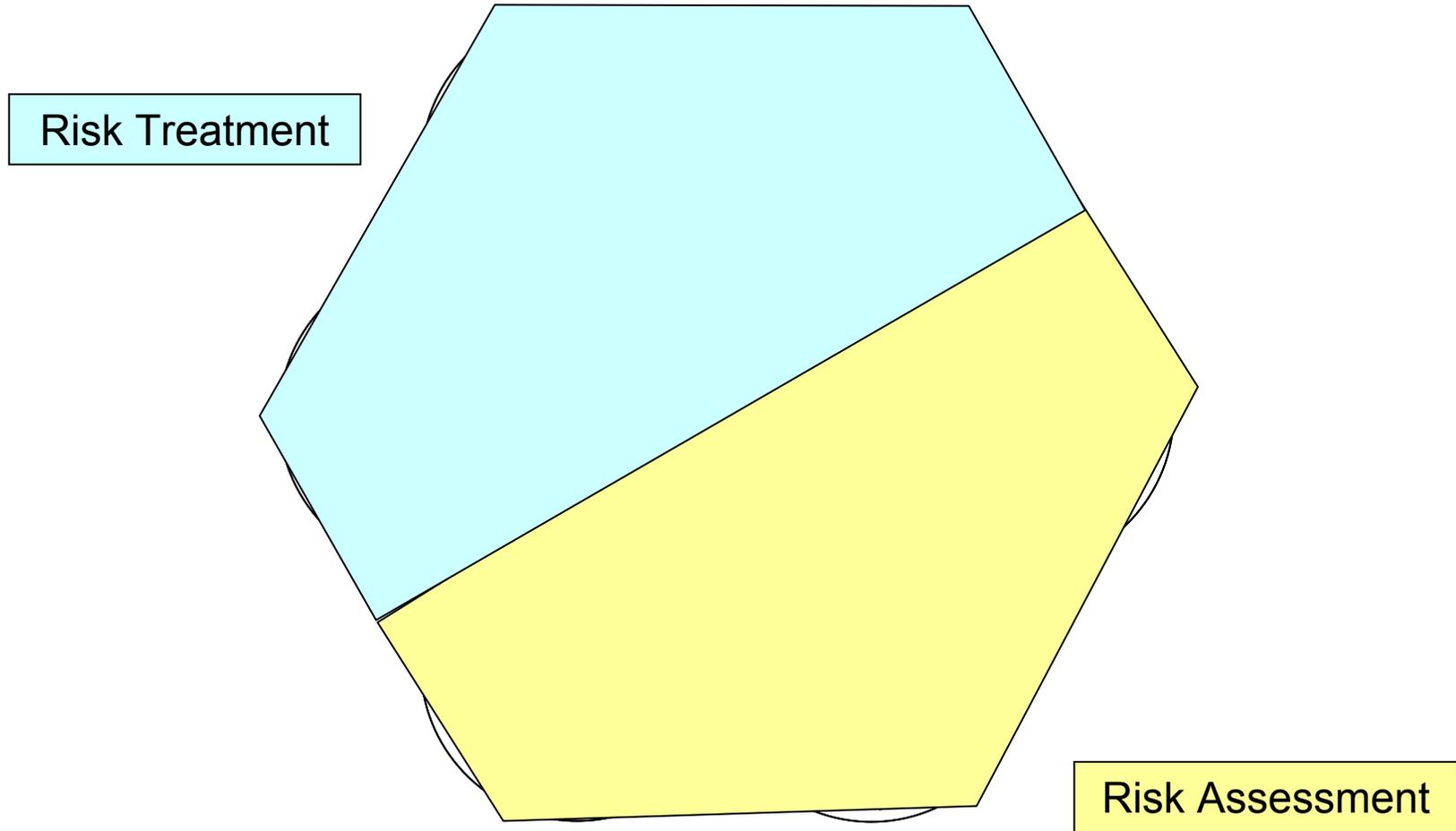
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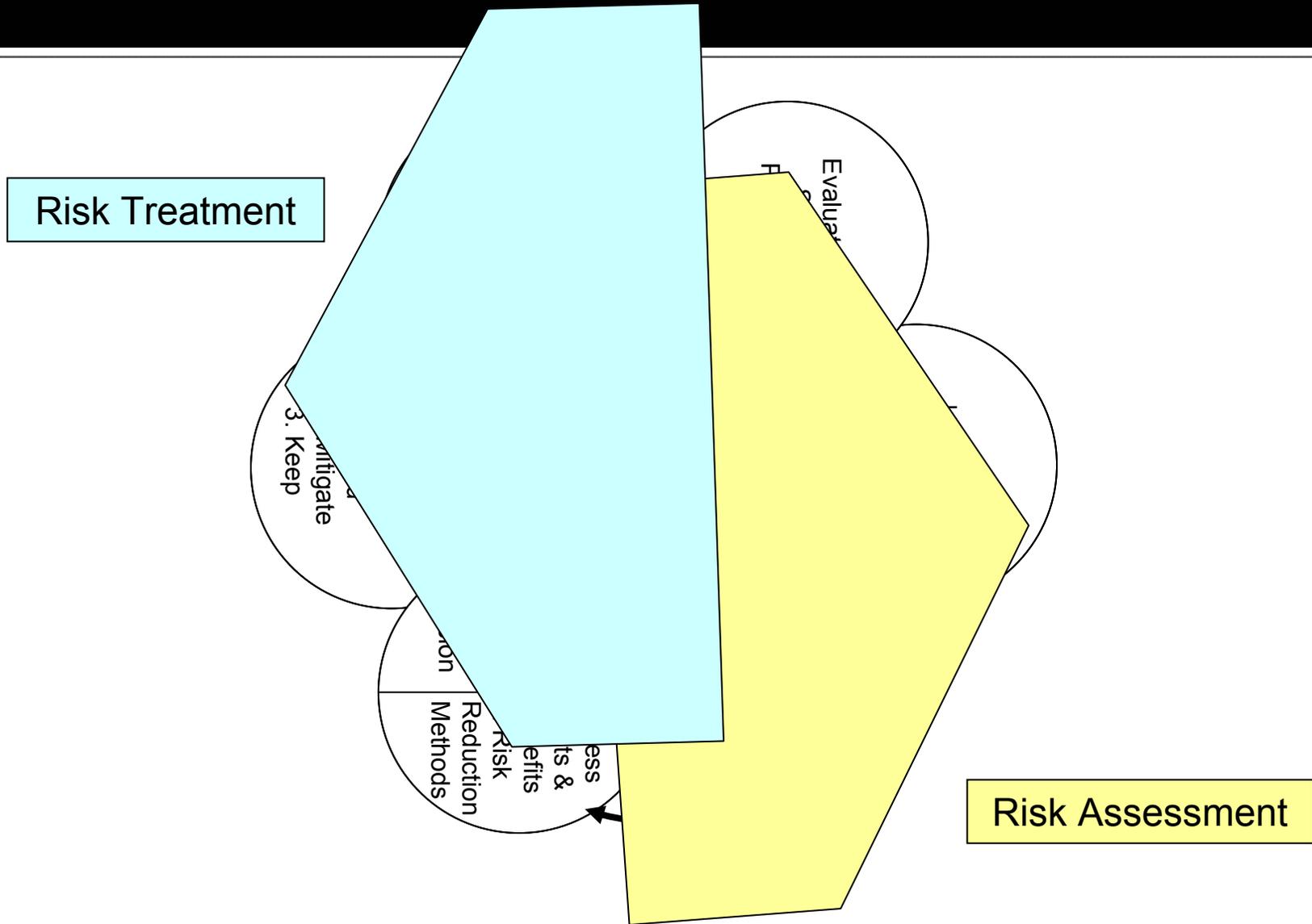
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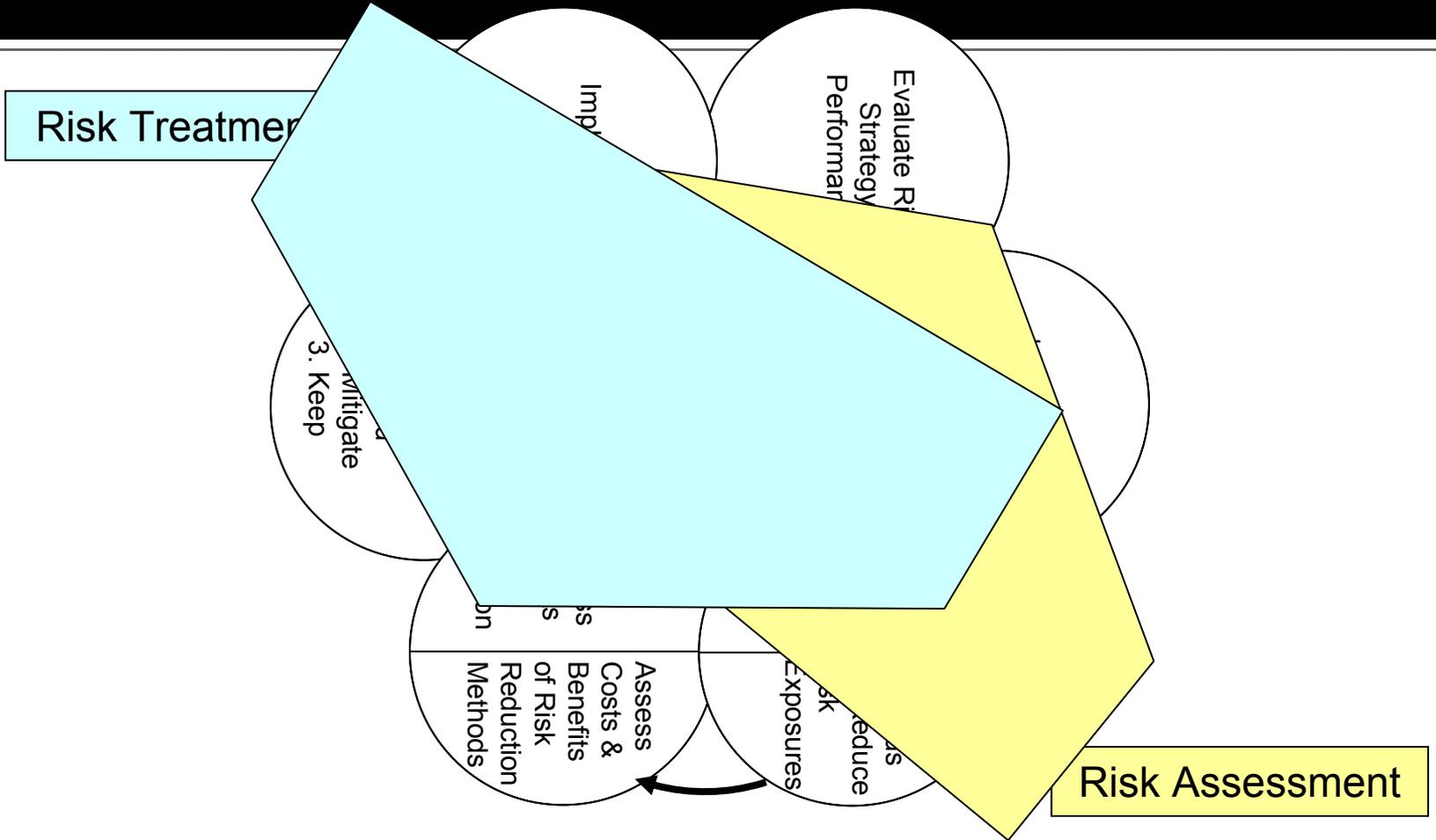
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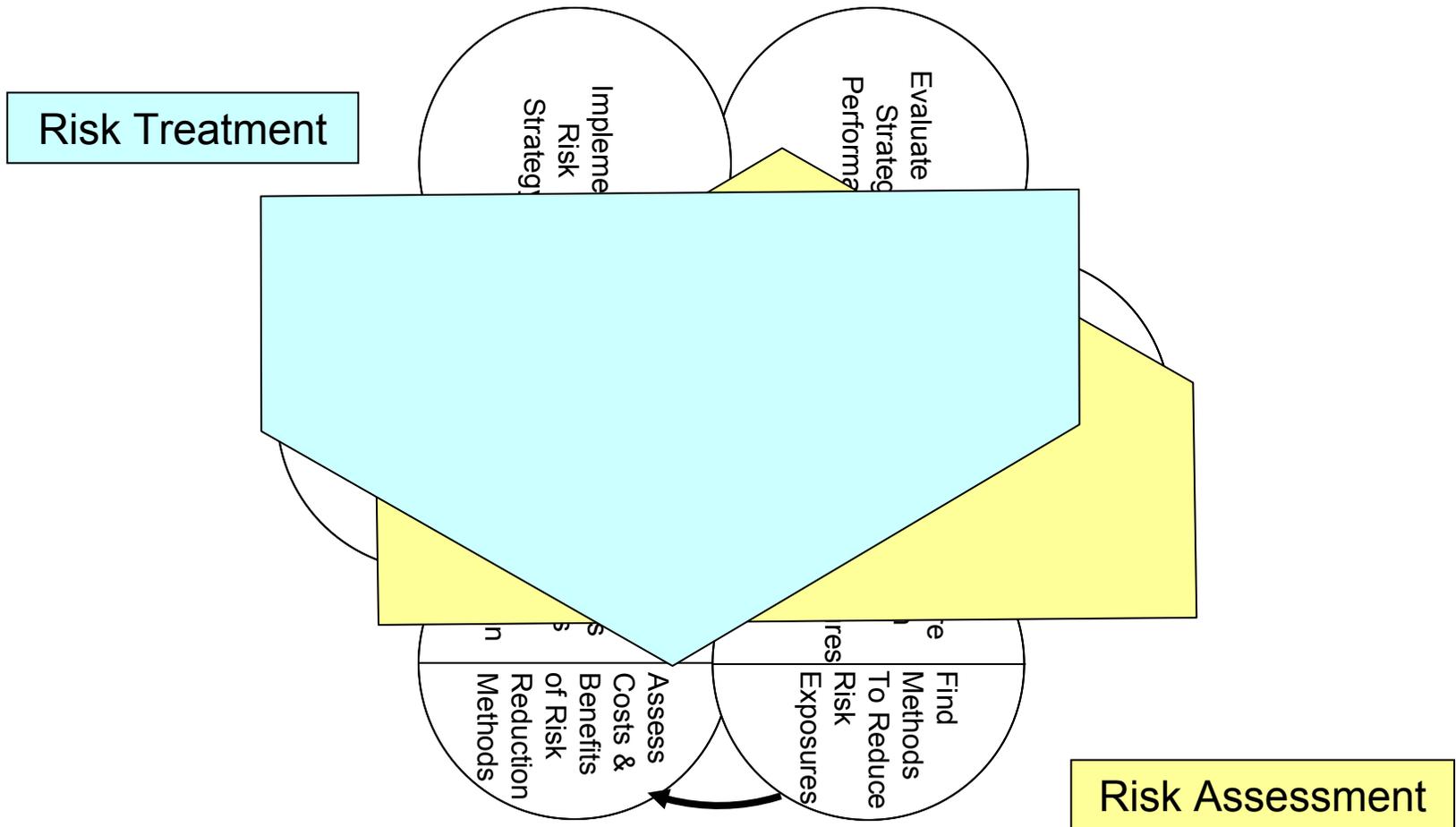
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Risk Management Process

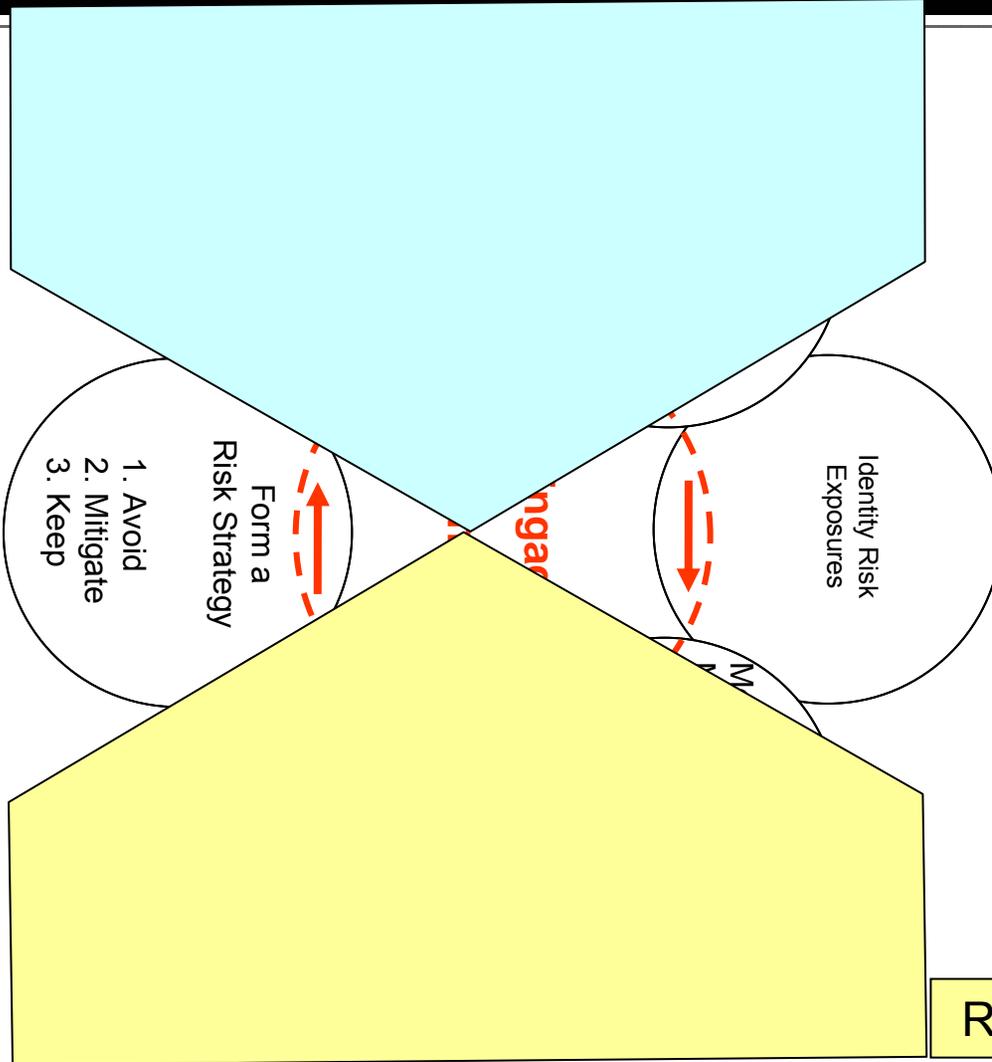


Risk Management Process

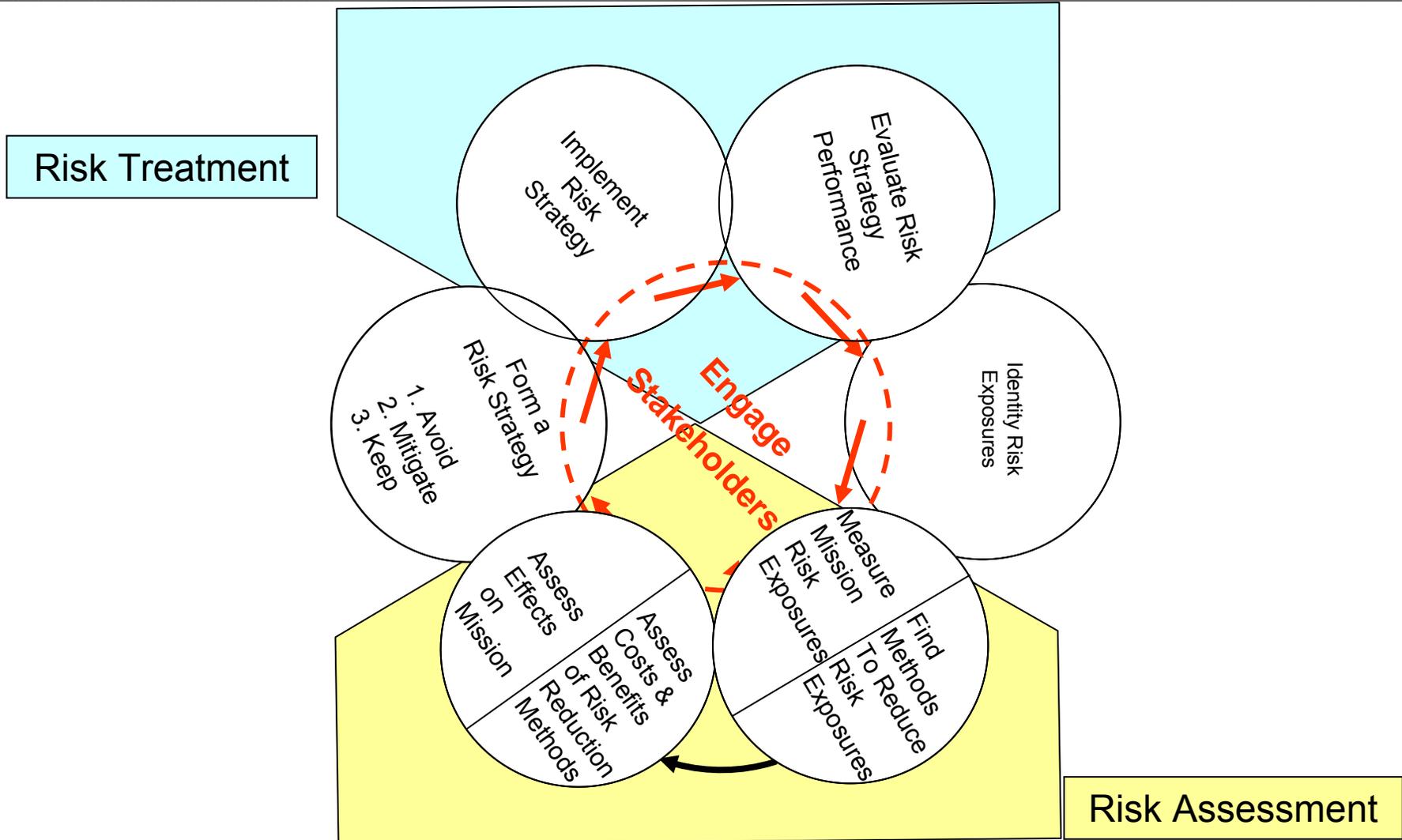


Risk Management Process

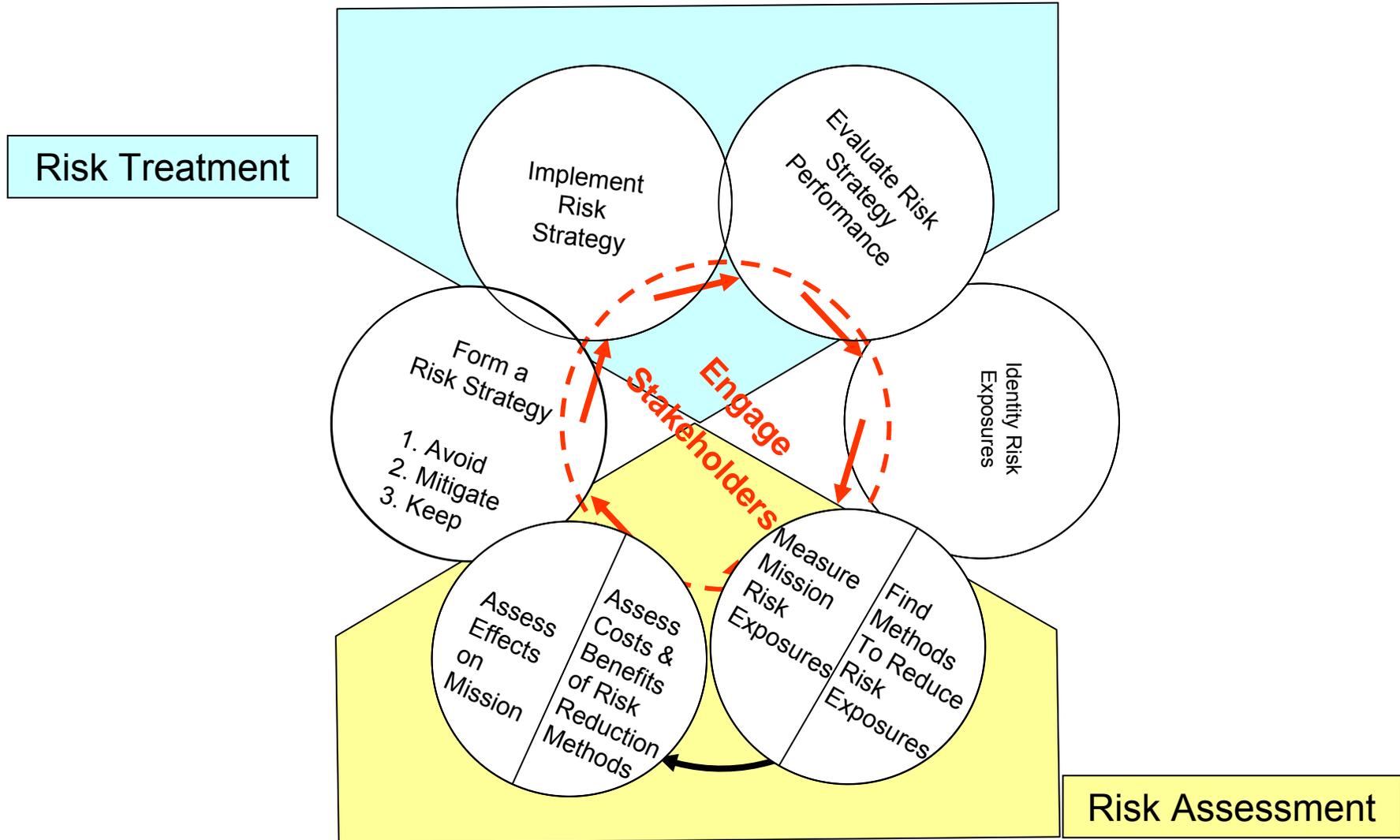
Risk Treatment



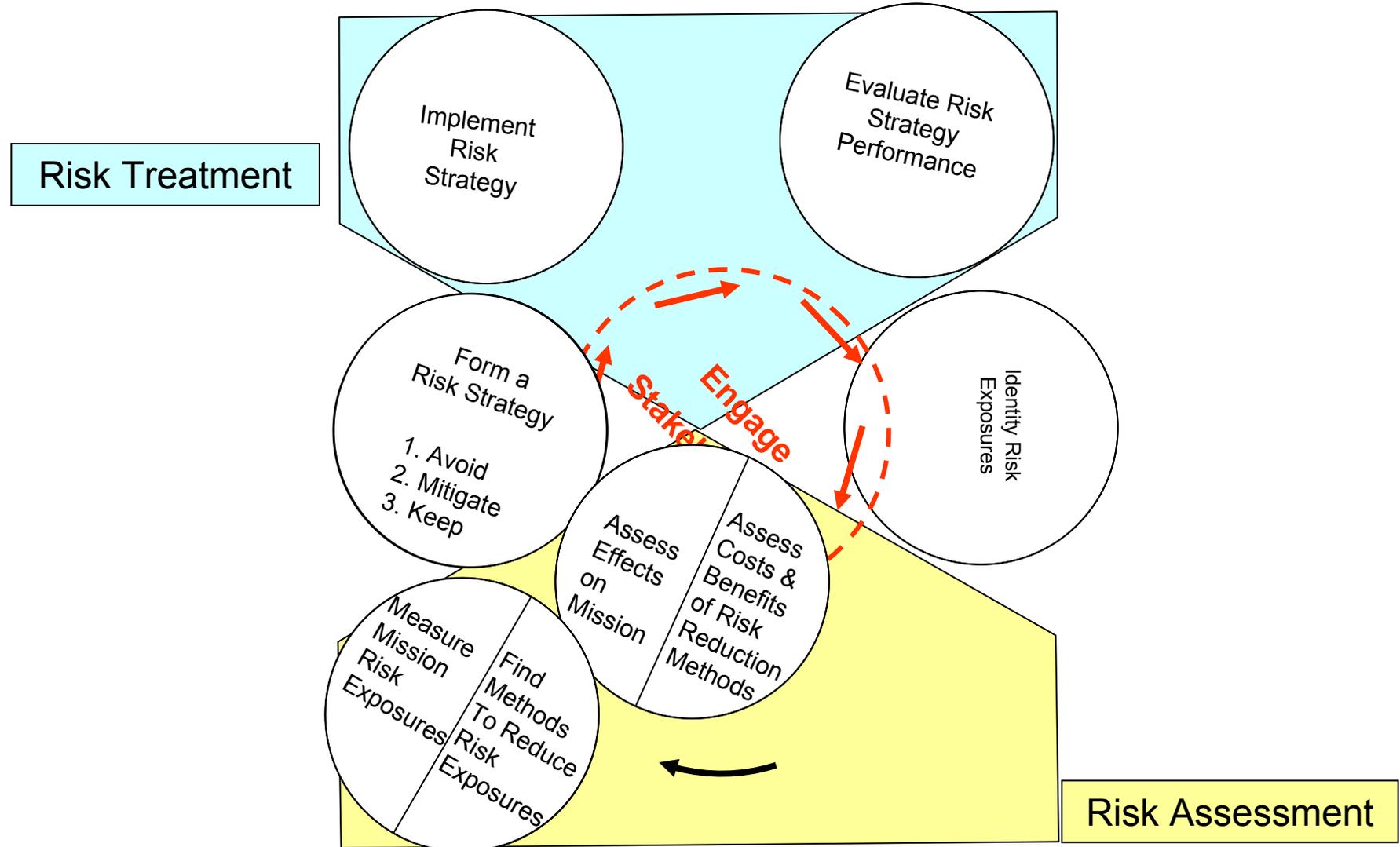
Risk Management Process



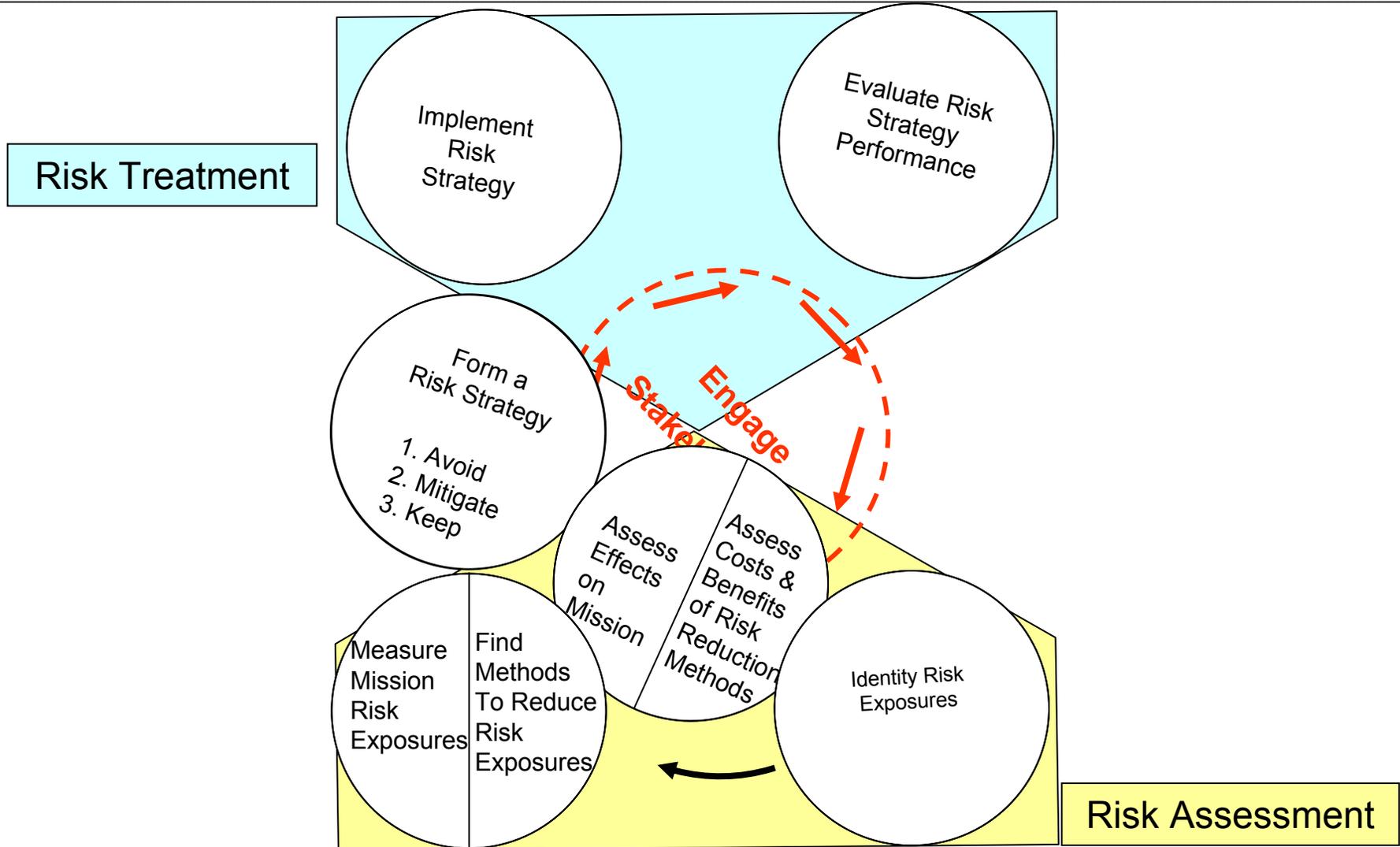
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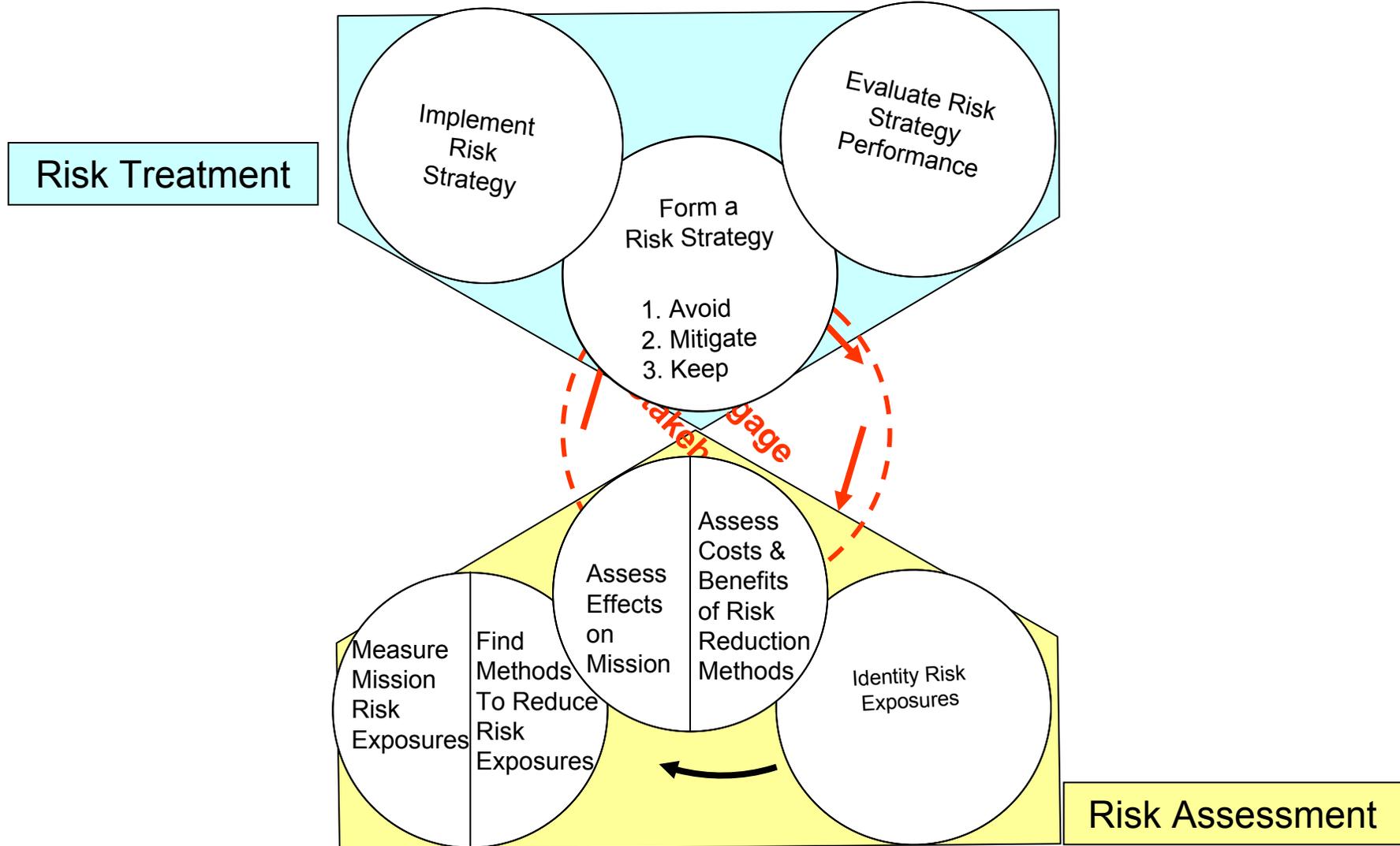
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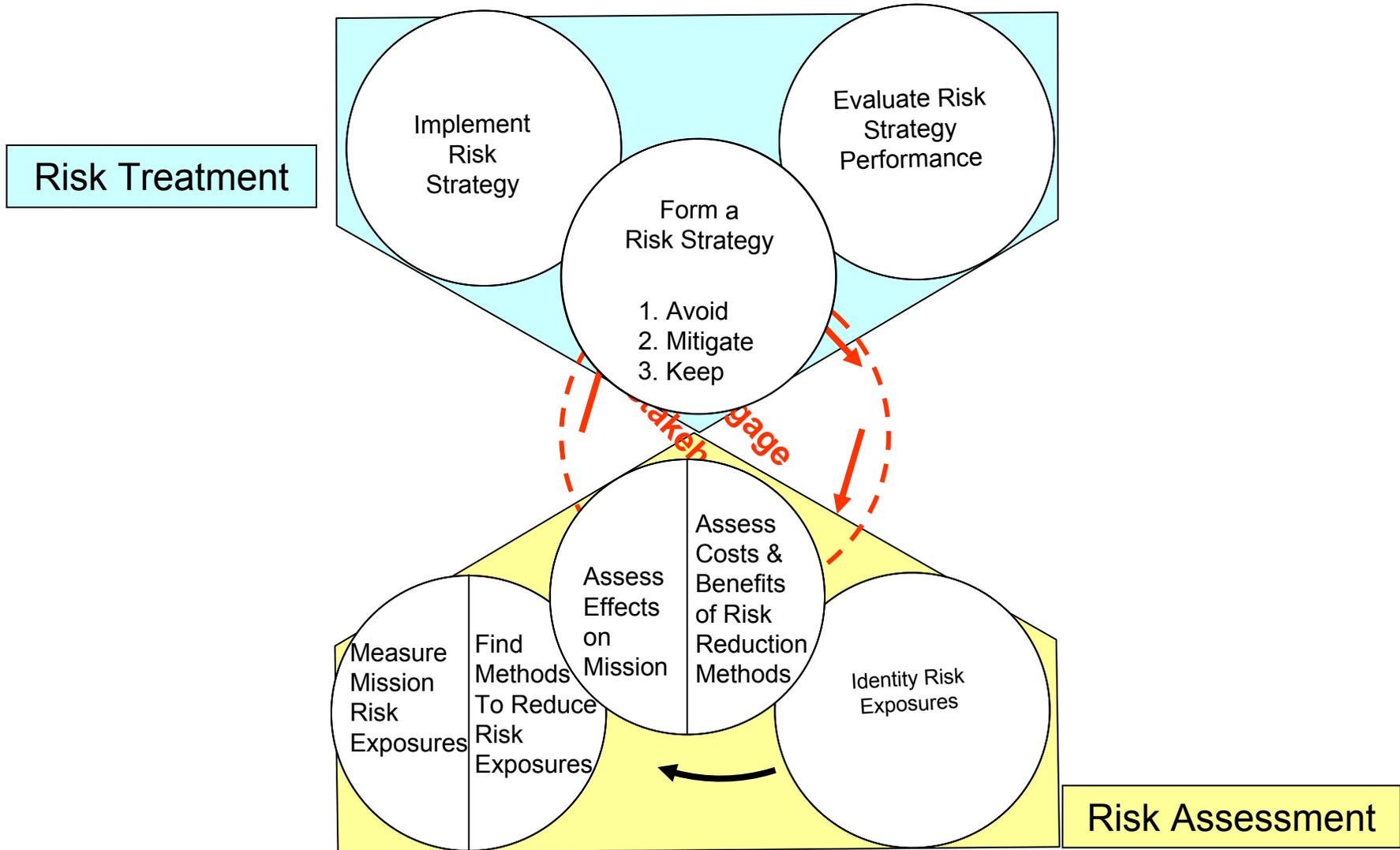
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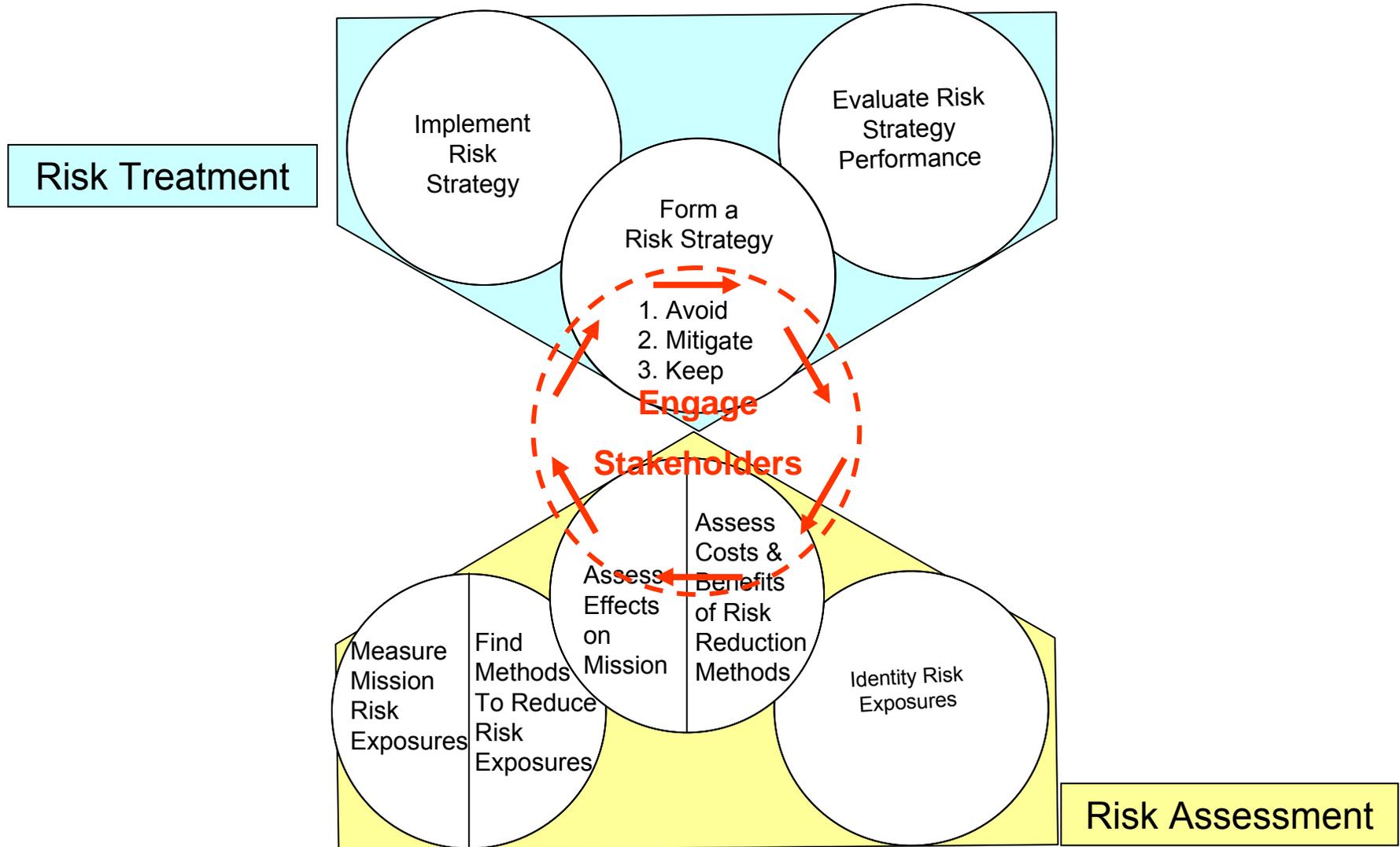
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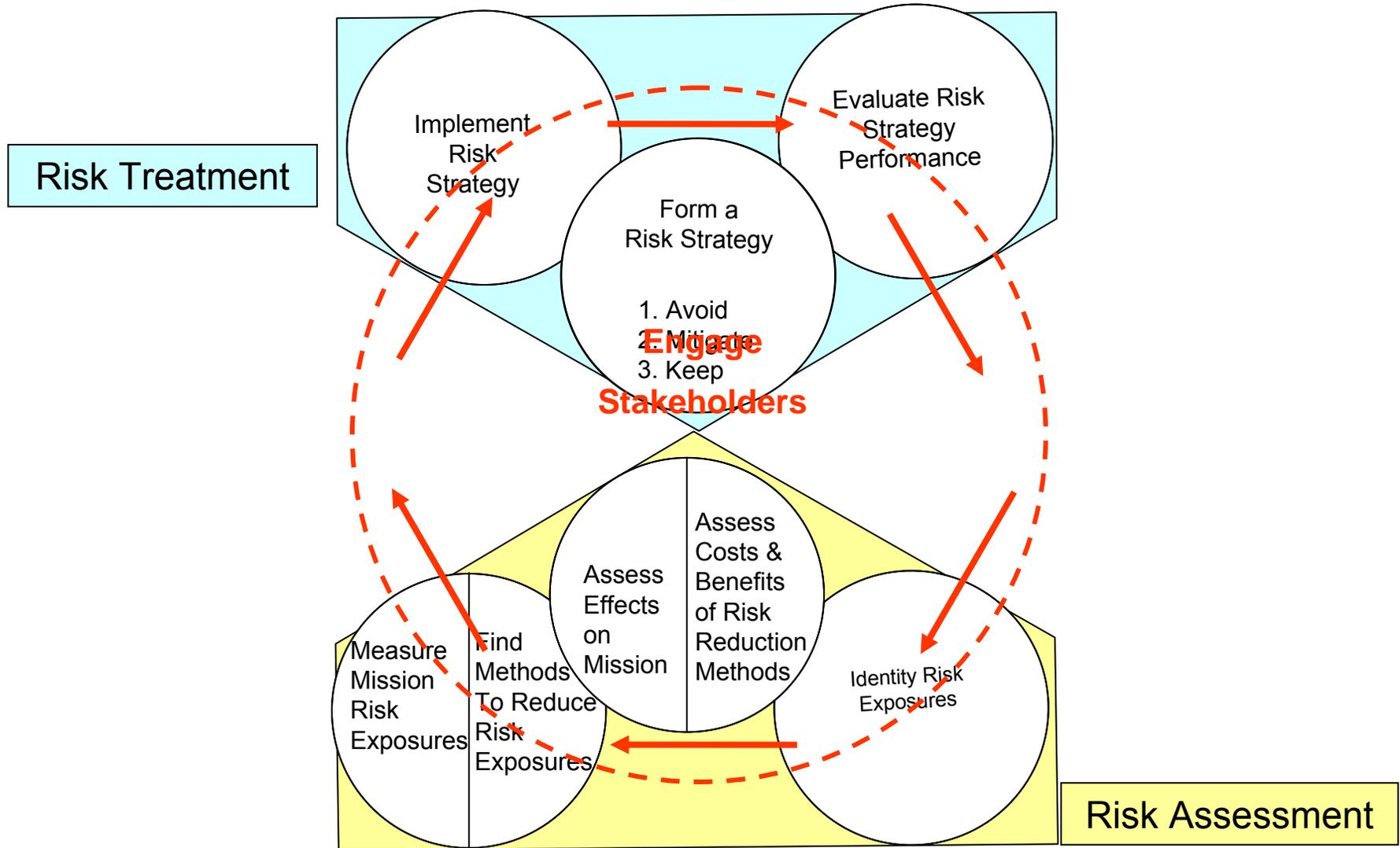
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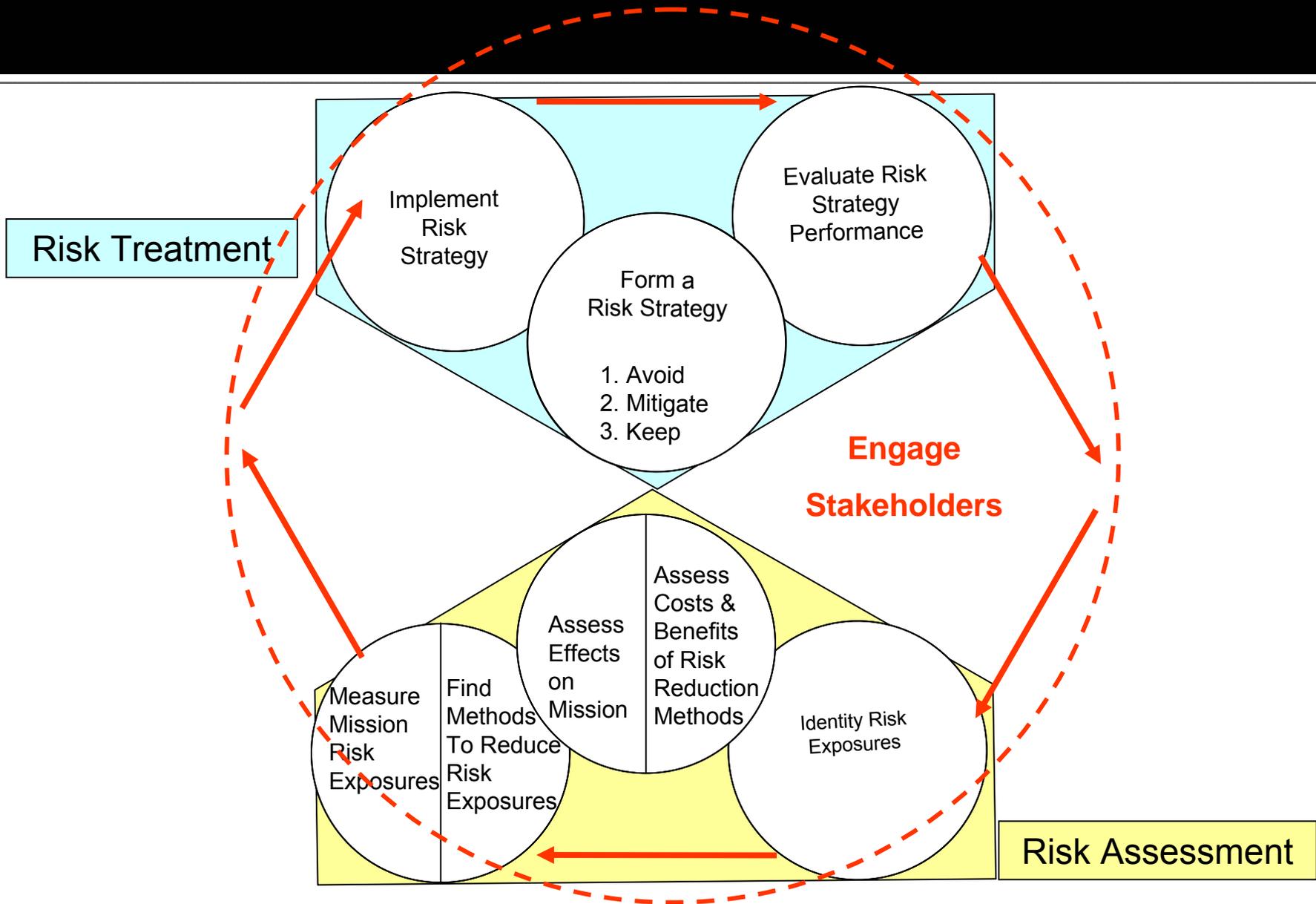
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Risk Management Process



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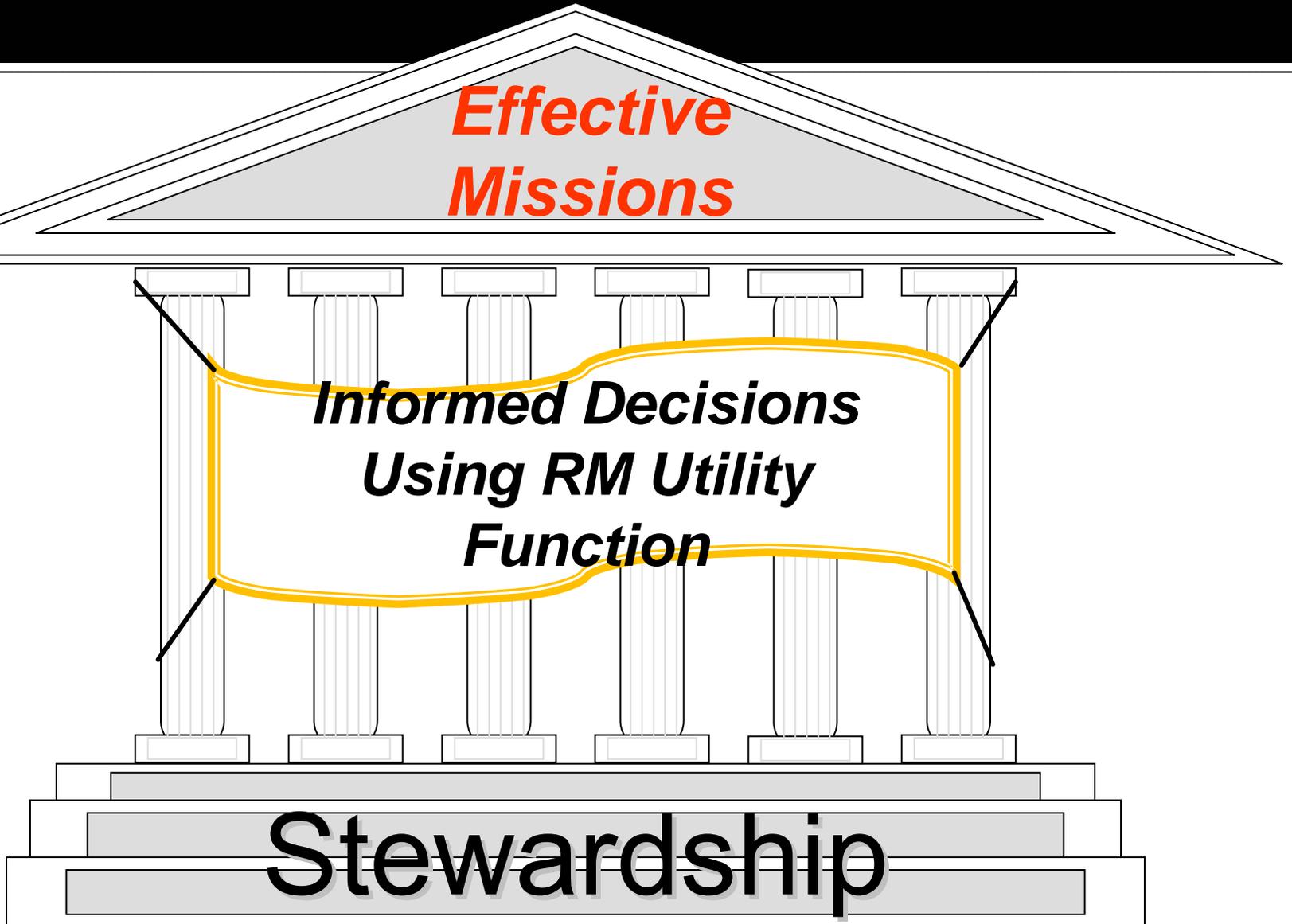


Successful Risk Management

*Effective
Missions*

*Informed Decisions
Using RM Utility
Function*

Stewardship



QUESTIONS

Thank you

References

- Albanese, R., Dacin, M. T., & Harris, I. C. (1997). *Agents as Stewards*. Academy of Management. The Academy of Management Review , 22 (3), 609-911. Retrieved October 3, 2007 from ProQuest database.
- Antelman, A., Dempsey, J. J., & Brodt, B. (n.d.). *Mission dependency index (MDI): An operational risk metric for assessing the criticality of naval shore facilities*. Port Hueneme, California: Naval Facilities Engineering Service Center.
- Apgar, D., (2006). *Risk intelligence: Learning to manage what we don't know*. Boston: Harvard Business School Press.
- Arnauld, A., & Nicole, P. (1996). *Logic or the art of thinking* (5th ed.). (J. V. Buroker, Ed., & J. V. Buroker, Trans.) Cambridge, England: Cambridge University Press. (Original work published 1662).
- Assessment and Risk Management (1997). Final Report, Risk Assessment and Risk Management In Regulatory Decision-Making, 2. Retrieved April 3, 2007 from <http://www.riskworld.com/Nreports/1997/risk-rpt/volume2/pdf/v2epa.PDF>
- Aven, T., (2003). *Foundations of risk analysis: A knowledge and decision-oriented perspective*. West Sussex, England: John Wiley & Sons
- Becker, G. S. (1993). *Human Capital*. Retrieved July 15, 2007, from The Concise Encyclopedia of Economics: <http://www.econlib.org/library/Enc/HumanCapital.html>

References

- Bedford, T., & Cooke, R. (2001). Probabilistic risk analysis: Foundations and methods. Cambridge, England: The Press Syndicate of the University of Cambridge.
- Bernstein, P. L. (1995). Risk as a history of ideas. *Financial Analysts Journal*, 51(1), 7-11. Retrieved September 10, 2007 from ProQuest database.
- Bernstein, P. L. (1996). *Against the gods: The remarkable story of risk*. New York: John Wiley and Sons, Inc.
- Collis, J. (2002, August 27). History of Risk. Retrieved September 12, 2007, from Memento: <http://www.agentsmith.com/memento/h/history+of+risk.html>
- Crashes: The DOTCOM Crash. (n.d.). Retrieved September 20, 2007, from Investopedia: <http://www.investopedia.com/features/crashes/crashes8.asp>
- Croughey, M., Galai, and D., Mark, R., (2006). *The essentials of risk management*. New York: McGraw-Hill
- Daneshkhah, A. R., (2004), Uncertainty in probabilistic risk assessment: A review. Retrieved August 6, 2007 from <http://www.shef.ac.uk/content/1/c6/03/09/33/risk.pdf>

References

- Davis, J. H., Schoorman, D. F., & Donaldson, L. (1997). Davis, Schoorman, and Donaldson reply: The distinctiveness of agency theory and stewardship theory. *Academy of Management. The Academy of Management Review* , 22 (3), 661-613. Retrieved October 3, 2007 from ProQuest database.
- Davis, J. H., Schoorman, D. F., & Donaldson, L. (1997). Toward a stewardship theory of management. *Academy of Management. The Academy of Management Review.* , 22 (1), 20-47. Retrieved October 3, 2007 from ProQuest database.
- Department of Defense (19 August 1998). Instruction Number 6055.1, DoD Safety and Occupational Health (SOH) Program. Washington DC: DUSD(ES)
- Department of Defense (Draft). Military Standard 882E, Department of Defense Standard Practice for System Safety. Washington DC: HQ AFMC/SES.
- Englehart, J. P. (1994). A historical look at risk management. *Risk Management*, 41(3), 65-61. Retrieved September 10, 2007 from ProQuest database.
- Fine, W. T. (1971). *Mathematical evaluations for controlling hazards*. White Oak, Maryland: Naval Ordnance Laboratory.
- Fine, W. T. (n.d.). *System to establish priorities for attention to explosive hazards*. Washington, DC: Government Publishing Office.
- Gervais, M., Livshits, I., & Meh, C. (2005, December 23). Uncertainty and the Specificity of human capital. Retrieved July 13, 2007, from Stanford Educational Group:
www.stanford.edu/group/SITE/archive/SITE_2006/Web%20Session%206/Livshits.pdf

References

- Gigerenzer, G., Swijtink, Z., Porter, T., Daston, L., Beaty, J., & Kruger, L. (1989). *The empire of chance: How probability changed science and everyday life*. Cambridge, England: Cambridge University Press.
- Goretti, A., & Pasquale, D. (2002). An overview of post-earthquake damage assessment in Italy. Earthquake Engineering Research Institute (EERI) Invitational Workshop (p. Retrieved from www.eeri.org/lfe/pdf/italy_molise_goretti_pasadena_paper.pdf). Pasadena, California: EERI.
- Grose, V. L., (1987) *Managing risk: Systematic loss prevention for executives*. Englewood Cliffs, NJ: Prentice Hall
- Group of Experts on the Safety Aspects of Transportation and Storage of Military Ammunition and Explosives, Storage Sub-Group, (2000). *Definitions Related to Quantitative Risk Analysis*. Brussels: North Atlantic Treaty Organization.
- Hacking, I. (2006). *The emergence of probability: A philosophical study of early ideas about probability induction and statistical inference*. (2nd ed.). Cambridge, England: Cambridge University Press.
- Hansson, S. O. (2005, August 23). *Decision theory: A brief introduction*. Retrieved May 21, 2007, from <http://www.infra.kth.se/~soh/decisiontheory.pdf>
- *History of Risk*. (n.d.). Retrieved September 12, 2007, from Memento: <http://www.agentsmith.com/memento/h/history+of+risk.html>

References

- Hui-Chao, L. (2004). Decision theory and analysis. *Futurics* , 28 (1/2), 27-46. Retrieved June 15, 2007 from ProQuest database.
- Kinney, G. F., & Wiruth, A. D. (1976). *Practical risk analysis for safety management*. China Lake, California: Naval Weapons Center.
- Koller, G., (2005). *Risk assessment and decision making in business and industry: A practical guide*, (2nd ed.), Boca Rotan, Florida: Chapman & Hall/CRC
- Lockhart, J. (2007, March). Corporate governance: What happened to trust?; The 'agency problem', i.e. the opportunistic or self-serving manager/employee, has shaped our understanding of governance. *New Zealand Management* , 68. Retrieved October 3, 2007 from ProQuest database.
- Lord's Prayer. (1997). Retrieved September 13, 2007, from Robin's Web: <http://www.robinsweb.com/inspiration/lordsprayer.html>
- Lulea University of Technology (2006), Licentiate Thesis, Risk management in small construction projects. Retrieved August 6, 2007 from <http://epubl.ltu.se/1402-1757/2006/57/LTU-LIC-0657-SE.pdf>
- Marrison, C., (2002). *The fundamentals of risk measurement*. Boston: McGraw Hill
- Morgan, M. G., & Henrion, M. (Eds.). (1990). *Uncertainty: A guide to dealing with uncertainty in quantitative risk and policy analysis*. Cambridge, England: Cambridge University Press.

References

- Morin, R. P. (n.d.). Economist Feldman takes different route toward assessing value of a life: In wrongful death cases, he says question should be 'How much would you be willing to pay to extend your life?' . Retrieved April 17, 2007, from GSJ: http://www.brown.edu/Administration/George_Street_Journal/value.html
- Preston, L. E. (1998). Agents, stewards, and stakeholders. *Academy of Management. The Academy of Management Review* , 23 (1), 9. Retrieved October 3, 2007 from ProQuest database.
- Proper, K. W. (1986). HAZEL - A computerized approach to system safety. 22nd DDESB Explosives Safety Seminar Proceedings. Anaheim, CA: Department of Defense Explosives Safety Board.
- Proper, K. W. (1994). A mathematical model for a quantitative risk matrix. *International System Safety Conference Proceedings*. New Orleans, Louisiana: System Safety Society.
- Proper, K. W. (1997). HAZEL - A computerized approach to system safety. *International System Safety Conference Proceedings*. New Orleans, Louisiana: System Safety Society.
- Risk-Based Explosives Safety Criteria Team. (2007). Technical Paper 14, Rev 3, Approved methods and algorithms for DOD risk-based explosives siting. Alexandria, Virginia: Department of Defense Explosives Safety Board.
- Scherpereel, C. M. (2006). Decisions orders: A decision taxonomy. *Management Decisions* , 44 (1), 122-126. Retrieved June 12, 2007 from ProQuest Database.

References

- Scholz, C., Stein, V., & Bechtel, R. (2005, January 26). Retrieved July 13, 2007, from Human Capital Management: The Saarbrucken Formula - A Brief Introduction https://www.saarbruecker-formel.net/ressourcen/scholz_brief_introduction.pdf
- Shapiro, S. P. (2005). Agency theory. *Annual Review of Sociology* , 31, 263-284. Retrieved October 3, 2007 from ProQuest database.
- Sophocles. (2000). *Oedipus the King*. (F. Storr, Editor, D. C. Stevenson, Producer, & Web Atomics) Retrieved September 12, 2007, from The Internet Classics Archive: <http://classics.mit.edu/Sophocles/oedipus.html>
- Steimetz, S. (n.d.). Bubbles, Bulbs, Bytes & Bonds. Retrieved September 20, 2007, from Thayer Watkins Web Page, San Jose State University: <http://www.ags.uci.edu/~ssteimet/bubbles.htm>
- Steimetz, S. (n.d.). Bubbles, Bulbs, Bytes & Bonds: The Classic Bubble: Tulip mania. Retrieved September 20, 2007, from Thayer Watkins Web Page, San Jose State University: <http://www.ags.uci.edu/~ssteimet/bubbles.htm>
- Supreme Court of the United States (Decided July 2, 1980). *Industrial Union Department, AFL-CIO v. American Petroleum Institute Et Al.* (No. 78-911, 448 U.S. 607; 100 S. Ct. 2844; 1980 U.S. LEXIS 55; 65 L. Ed.2d 1010; 10 ELR 20489)
- Taleb, N. N. (2005). *Foiled by randomness: The hidden role of chance in life and in the markets*. New York: Random House Trade Paperbacks.

References

- Taleb, N. N. (2007). The black swan: The impact of the highly improbable. New York: Random House.
- The Presidential/Congressional Commission on Risk Assessment and Risk Management (1997). Final Report, Risk Assessment and Risk Management In Regulatory Decision-Making, 1. Retrieved April 3, 2007 from <http://www.riskworld.com/Nreports/1997/risk-rpt/volume2/pdf/v2epa.PDF>
- U.S. Department of Transportation, Federal Highway Administration, (n.d.). Risk assessment and allocation for highway construction management. Retrieved August 6, 2007 from http://international.fhwa.dot.gov/riskassess/risk_hcm06_03.htm
- Warsh, D. (Ed.). (2002, November 10). Better men and better women. Retrieved September 12, 2007, from Economic Principals: <http://www.economicprincipals.com/issues/02.11.10.html>
- Wilson, L. & McCutcheon, D., (2003). Industrial Safety and Risk Management. Alberta, Canada: The University of Alberta Press.