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**Supreme
Allied
Commander
Transformation**

**Multidimensional Risk Management at NASA
and Its Potential Use at
NATO Allied Command Transformation
Operations Research and Analysis Conference 2021**

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**ACT – Leading NATO
Military Transformation**

1 Who is NATO ACT?

2 Risk Management at ACT

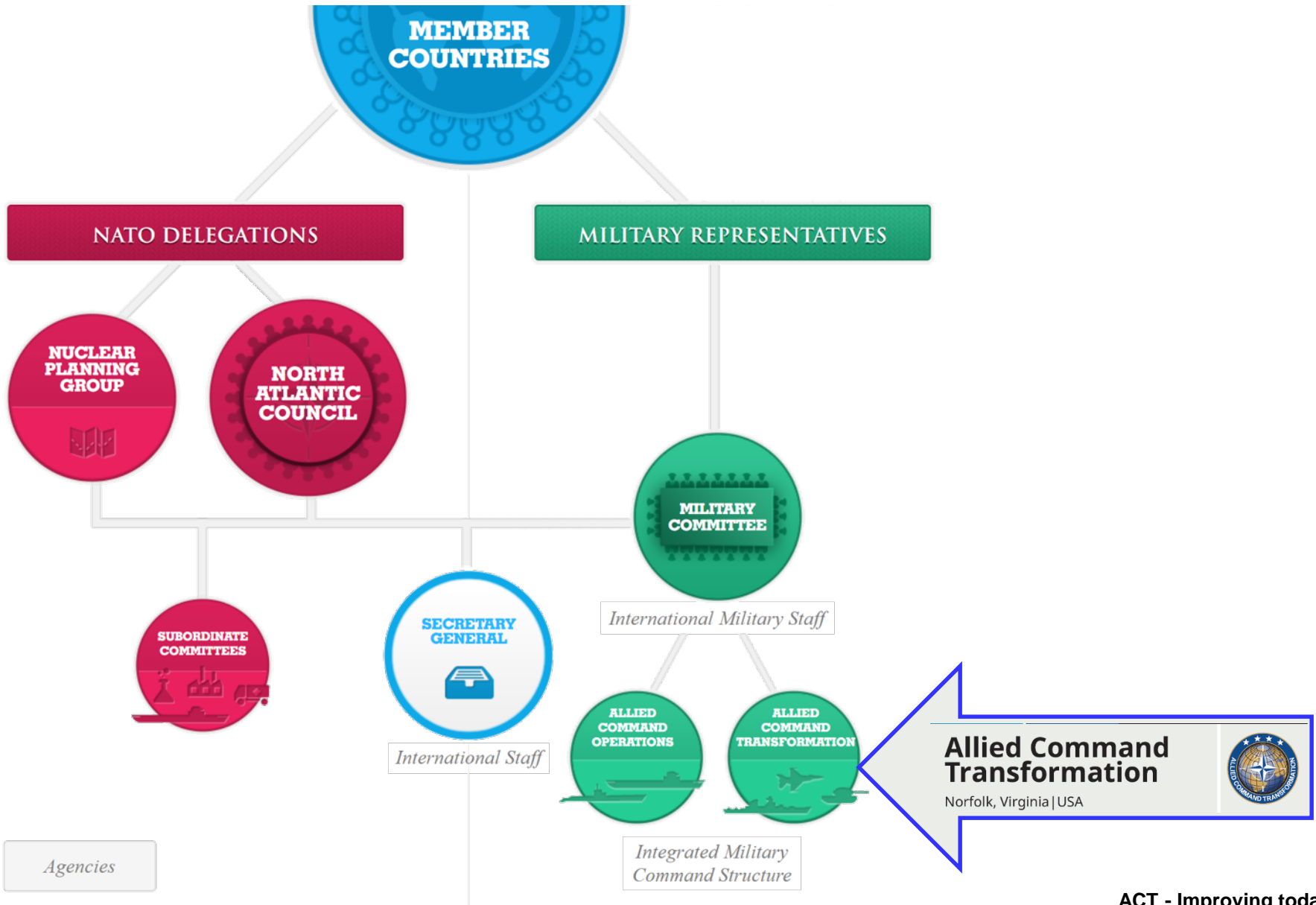
3 Risk Management at NASA

4 Quick Review

Who is Allied Command Transformation?



ACT in NATO



Agencies

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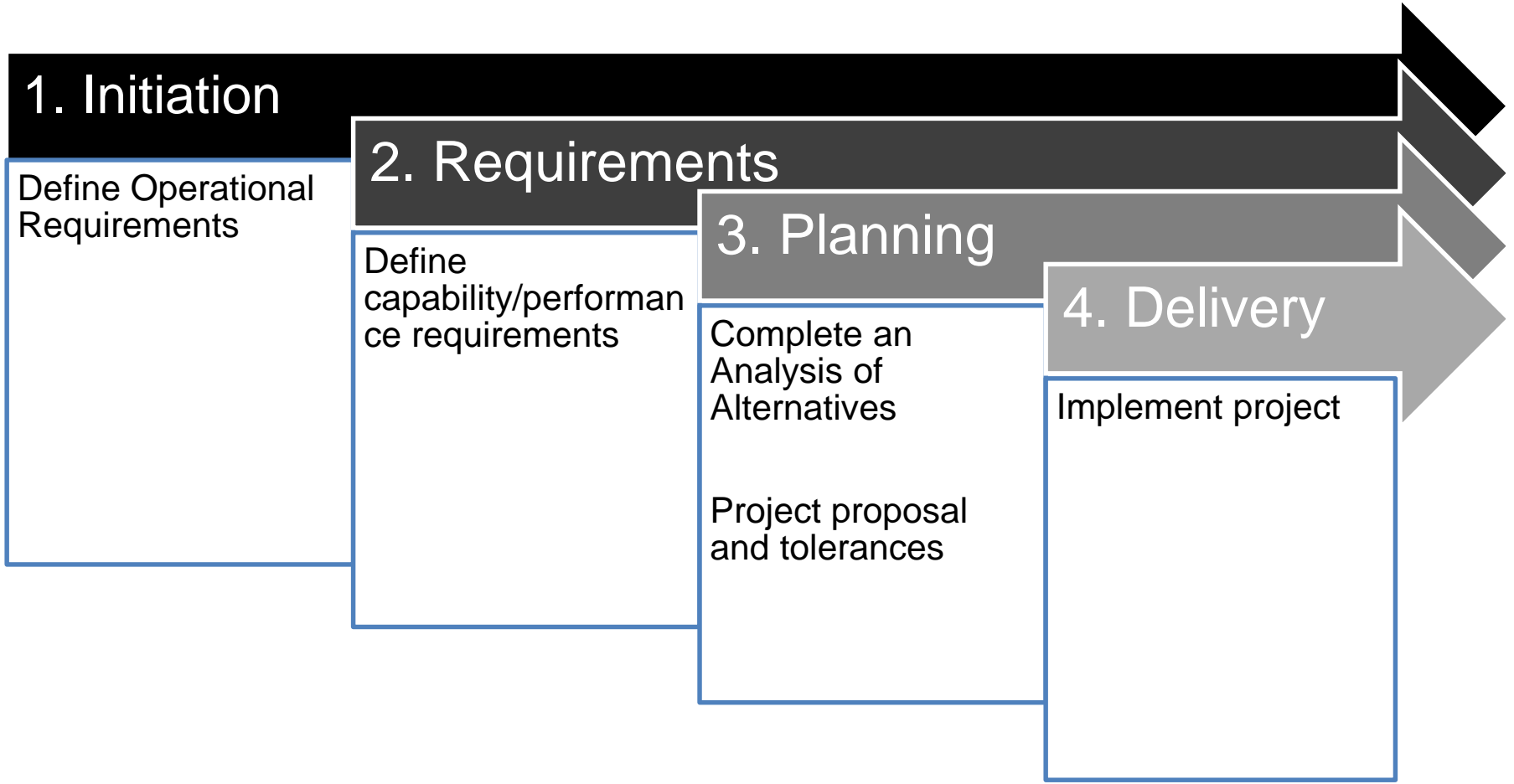
ACT - Improving today,
Shaping tomorrow,
Bridging the two

Warfare Development for NATO

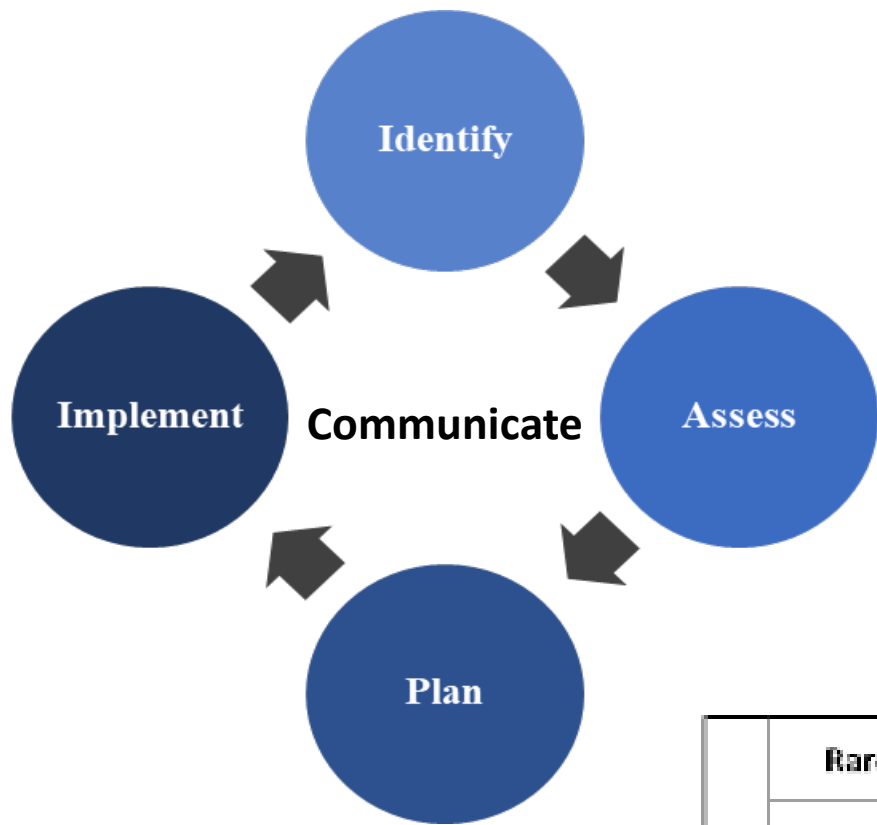


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ACT - Improving today,
Shaping tomorrow,
Bridging the two



Risk Management at ACT



Qualitative Assessment

		Impact				
		Trivial	Minor	Moderate	Major	Extreme
Probability	Rare	Low	Low	Low	Medium	Medium
	Unlikely	Low	Low	Medium	Medium	Medium
	Moderate	Low	Medium	Medium	Medium	High
	Likely	Medium	Medium	Medium	High	High
	Very likely	Medium	Medium	High	High	High

Risk Register

Risk ID	Risk Title	Proximity	Probability	Impact	Risk Score
R_01	AAA	Medium-term	3	3	9
R_02	BBB	Short-term	3	3	9
R_03	CCC	Short-term	3	4	12
R_04	DDD	Short-term	3	4	12
R_05	EEE	Short-term	3	4	12
R_06	FFF	Short-term	3	5	15

ISSUES:

- Multiple risks with the same risk score
- Proximity is difficult to factor into prioritization

Project Co-ordinator

- Owns individual project level risks
- Timely risk identification, management and reporting;

Risk Owner

- Management and control of all aspects
- of individual risks
- Similar to Project Co-ordinator

Risk Actionee

- Carry out the risk response action
- Usually same person as risk owner

Risk Specialist

- Trained in Risk Management practice

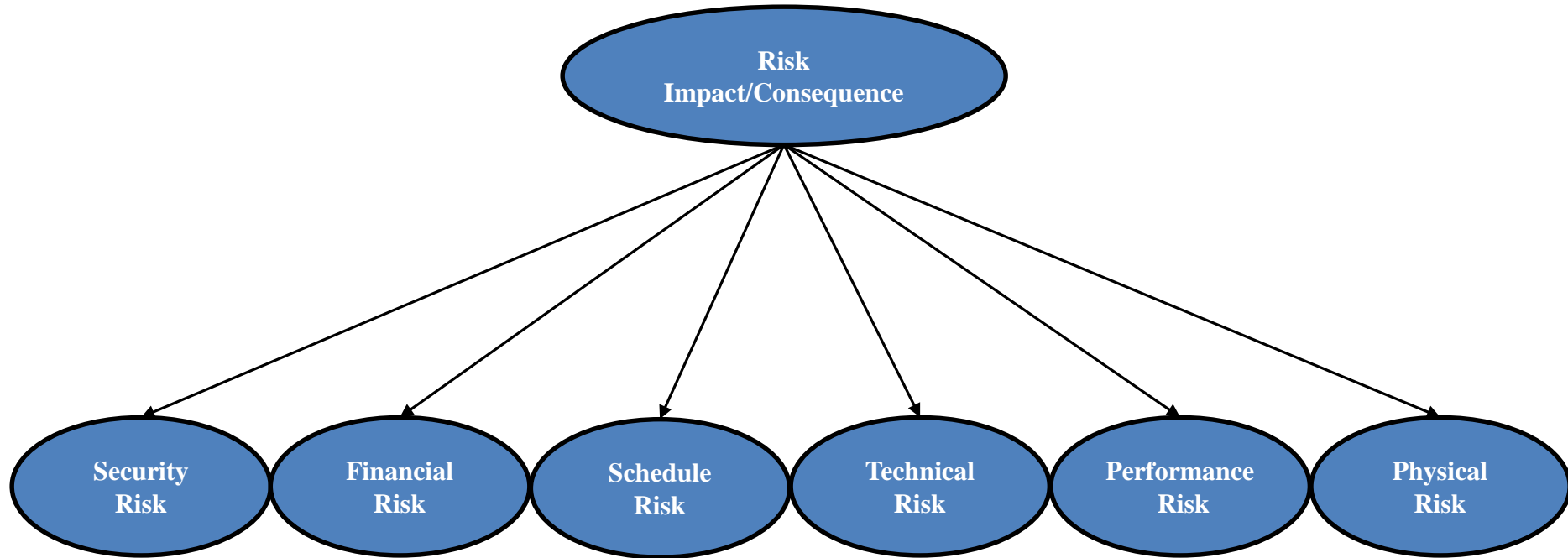
Frequently, the above roles fall on the Project Co-Ordinator

Risk Management at NASA

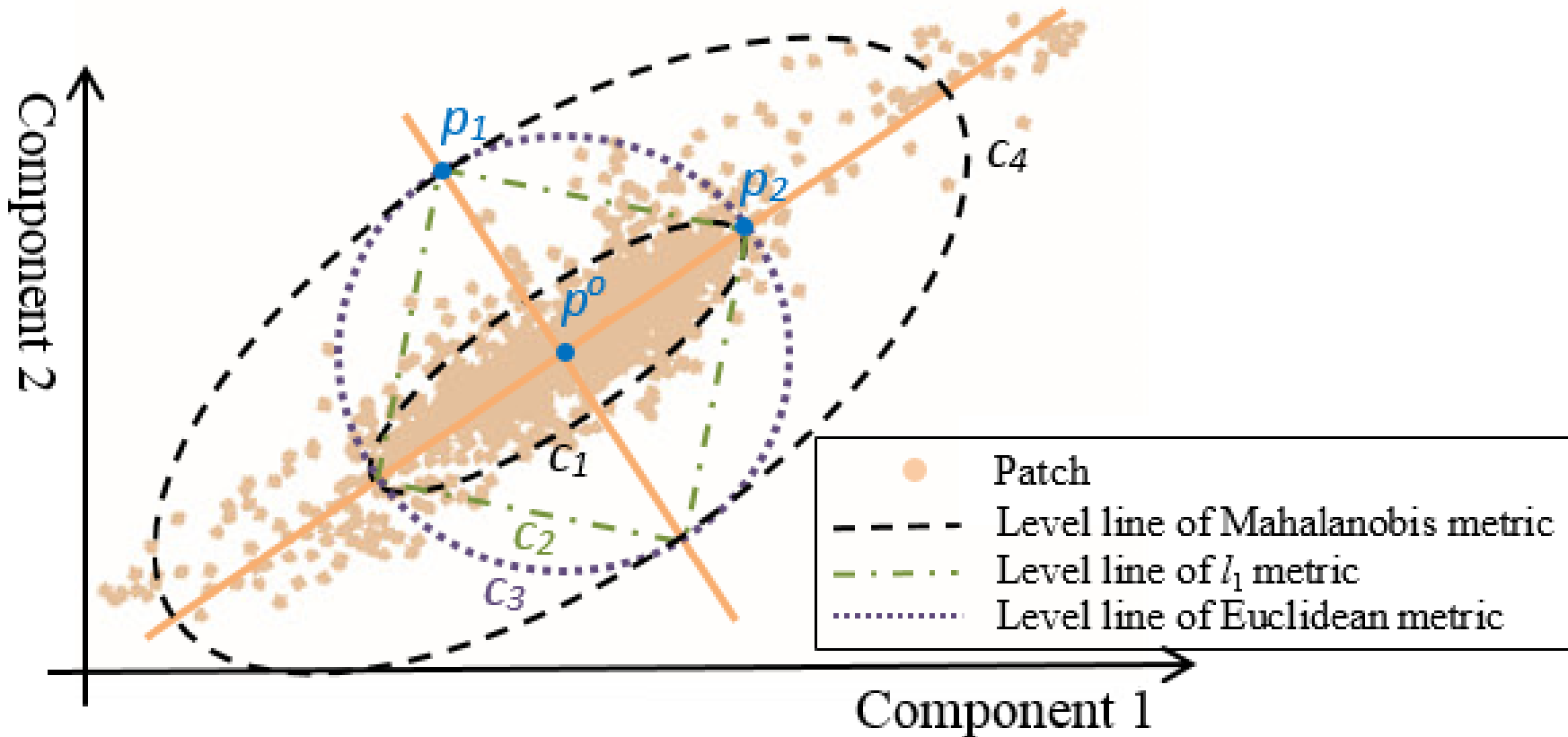


Quantitative vs Qualitative Risk Assessment

Quantitative Approaches	Qualitative Approaches
Results are based on objective measures	Results are based on subjective measures.
Cost and benefit issues are important	Monetary value of assets is not important.
Requires large amount of historical information like threat frequency, likelihood, etc.	Limited effort is required to develop monetary value, threat frequency
More complex process, mathematical tools are required	Relatively straight forward, mathematical tools are not needed
Mostly performed by technical and security staff	Can be performed by non-technical and non-security staff

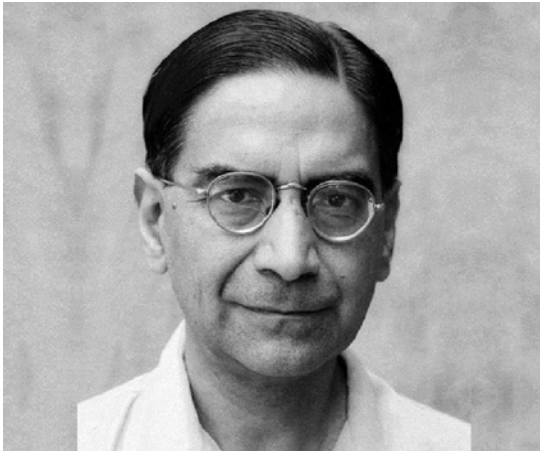


Mahalanobis vs Euclidean



Euclidean: Measure of the distance between 2 points (p_1 to p_2)

Mahalanobis: Measure of the distance between a point P and a distribution D (p_1 or p_2 to p_0)



- Indian scientist/statistician
- Developed Mahalanobis distance in 1936

Advantages:

Accounting for correlation between variables

Using normalized Euclidean distance when correlation doesn't exist or when vectors occupy the same plane

Can be scaled to infinite dimensions, meaning the technique will never lose validity as the number of dimensions grow

Questions?

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