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Implications for Organizational Systems Resilience

Multiple Pathways of Influence for Tightly and Loosely Structured Organizations

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NNSA National Nuclear Security Administration

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Organizations are ubiquitous and integral to many societal functions

Business and Corporate

- Profit generation
- Customer needs
- Competitive advantage

Technology and Innovation

- New technologies and advancements
- Data privacy and security

Government and Public

- Public service
- Policy development
- Effective governance

Manufacturing and Industrial

- Quality control
- Cost-effectiveness
- Regulations and standards

Organizations are structured in different ways

Different organization types:

- Public vs private

- Non-profit vs profit

- Cooperatives vs competitive

- Distributed vs hierarchical

Differences in:

- Goal and objectives

- Stakeholders

- Funding and resources

- Regulations and compliance

- Performance metrics

Need to generalize overarching organizational structures to enable creation of models that can capture common characteristics and behaviors across different organizations.
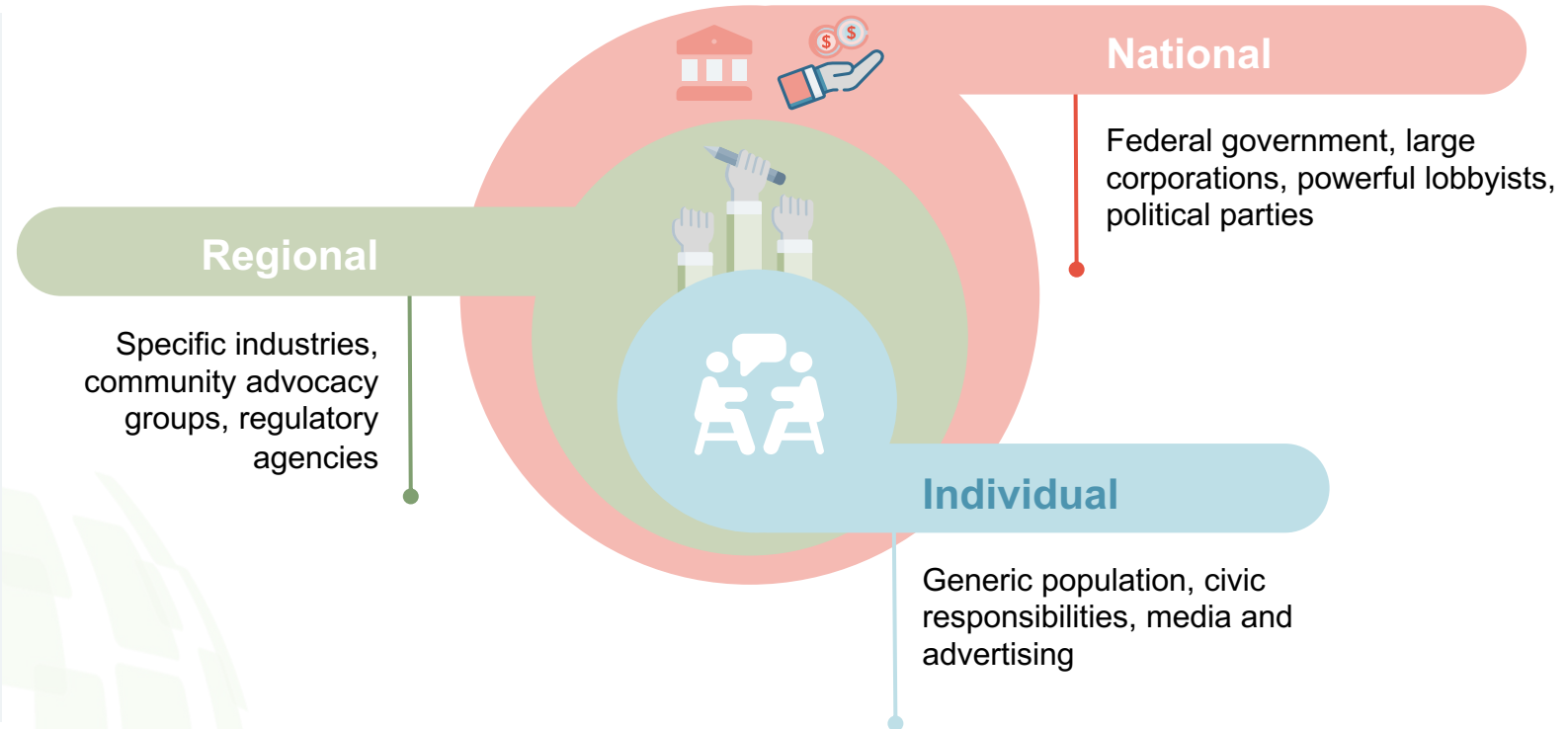
The Viable Systems Model framework provides a way to describe and design organizations

- Conceptual framework developed by Stafford Beer to understand and analyze the structure and functioning of complex organizations (Beer, 1984)

- Emphasizes the importance of each subsystem having a degree of autonomy and control and coordination by higher-level subsystems

Operations

Coordination
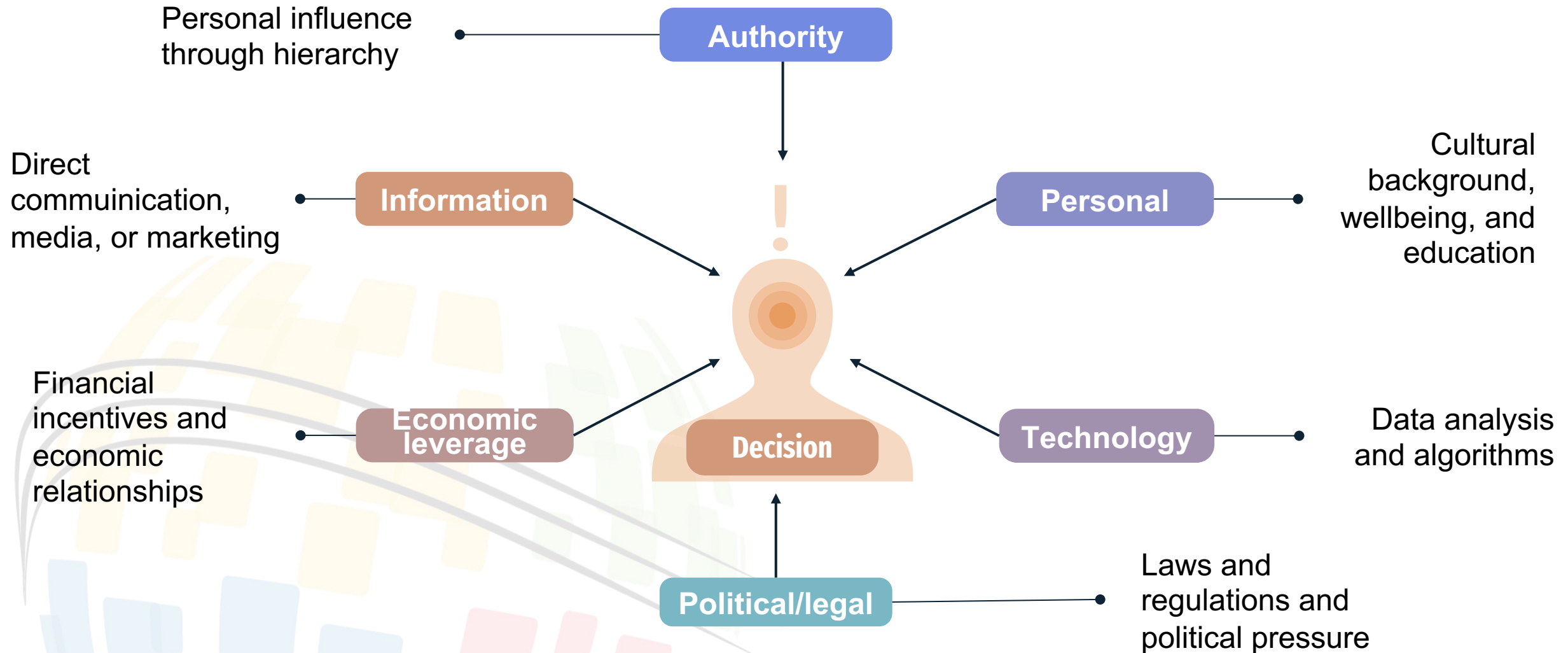
Management

Intelligence

Policy
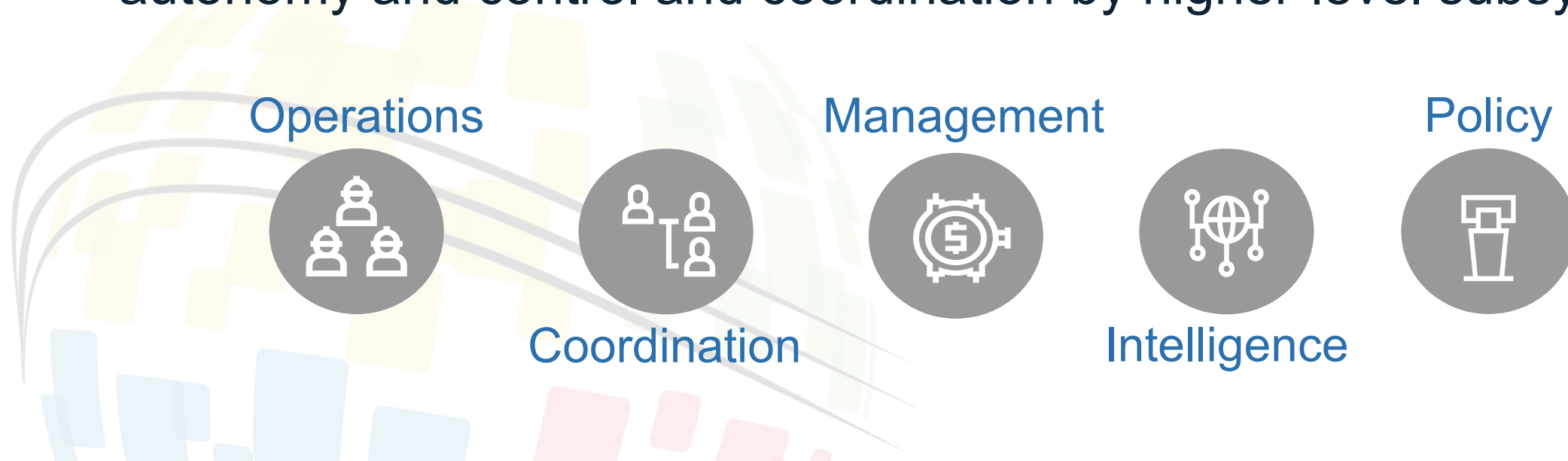
Organizations do not operate in isolation

Thus, it is essential to examine organizational decision-making not only from an **internal structural** viewpoint, but also by considering how **various influential factors** can impact the functions of organizational components.

National

Federal government, large corporations, powerful lobbyists, political parties

Regional

Specific industries, community advocacy groups, regulatory agencies

Individual

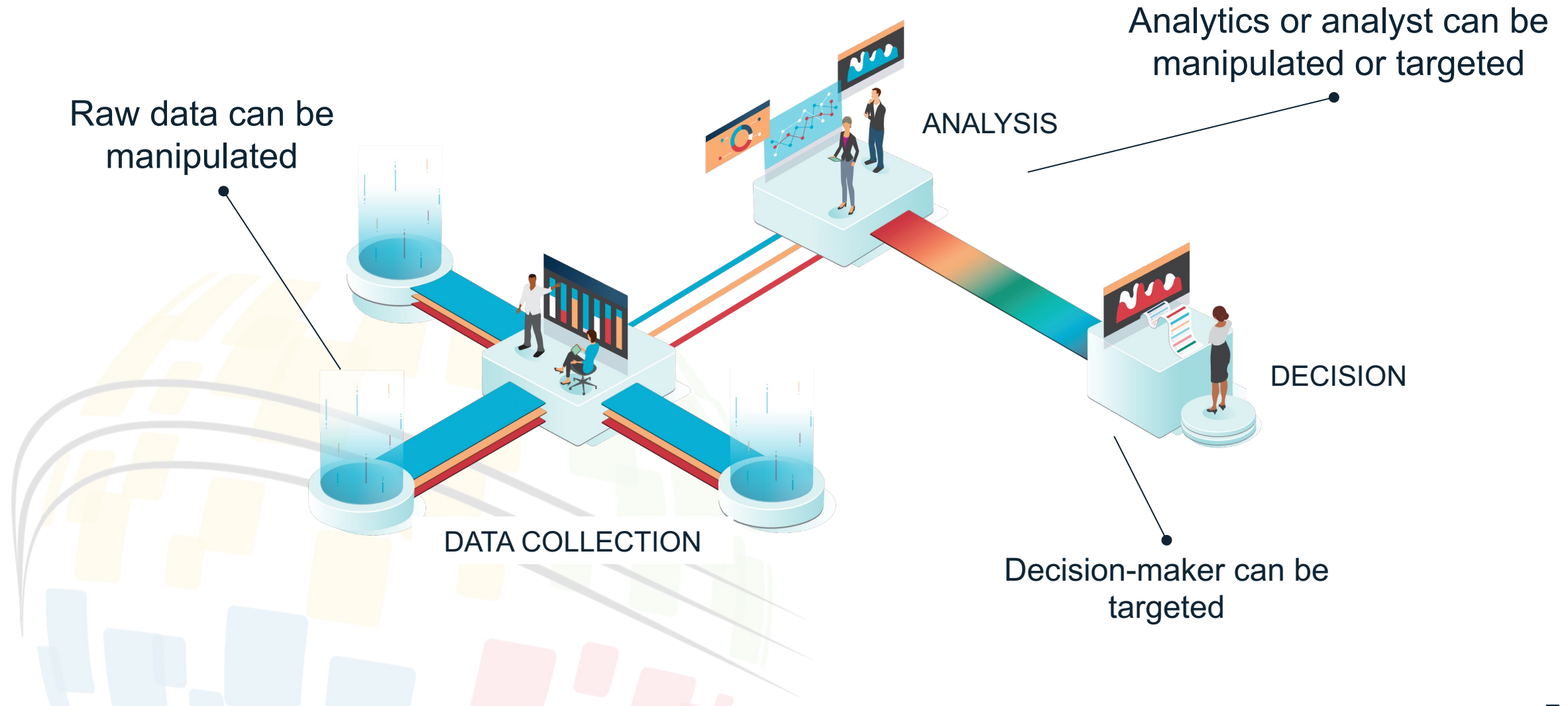Generic population, civic responsibilities, media and advertising

Examples include funding sources, regulations, consumers, and information

Organization decisions can be controlled, persuaded, or impacted by various influences

Personal influence through hierarchy

Authority

Direct commuinication, media, or marketing

Information

Personal

Cultural background, wellbeing, and education

Financial incentives and economic relationships

Economic leverage

Decision

Technology

Data analysis and algorithms

Political/legal

Laws and regulations and political pressure

Organizations can be influenced at different levels

Analytics or analyst can be manipulated or targeted

ANALYSIS

Raw data can be manipulated

DECISION

DATA COLLECTION

Decision-maker can be targeted

| Background | Model Design | Results | Conclusion |

Disinformation has impacted organizations' decision-making

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Global perspective Human stories

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Nearly 8 years on, 'gaps, inconsistencies, discrepancies' remain over Syria chemical weapons declaration

© UNICEF/Giovanni Diffidenti | Boys wander amid rubble of destroyed buildings in Idlib, Syria. (file)

Source: Peace and Security, 2021

PLOS MEDICINE

OPEN ACCESS

POLICY FORUM

What Led to the Nigerian Boycott of the Polio Vaccination Campaign?

Katsina · Kano · Jigawa · Kaduna · Bauchi

Nigeria

Source: Jegede, 2007

| Background | Model Design | Results | Conclusion |

Knowledge gaps exist at the intersection of organization and disinformation

Organizational resilience research:

- Focuses on acute disruptions to business operations
- Post-incident reviews
- Metrics focus on operational or capacity slack for business scope
- Key performance indicators that can guide improvement analyses not yet identified

Disinformation research:

- Focuses on automated detections and media disseminations
- More reactive than proactive
- Behavior metrics capture perceptions rather than decision-making strategies
- Has not actively considered organizational processes

?

Background	Model Design	Results	Conclusion
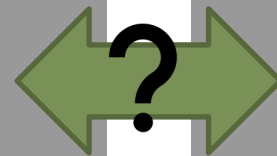
Motivating Research Questions

01 **Organizational structure** How does the application of a generalized framework for organizational structures facilitate modeling analysis, understanding, and prediction of information flows?
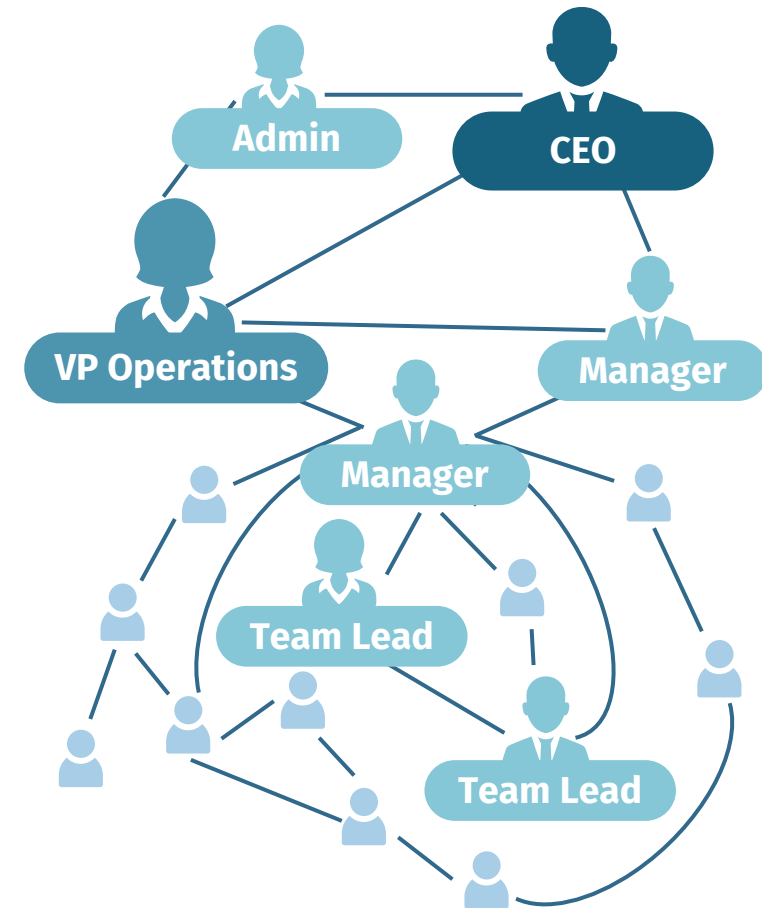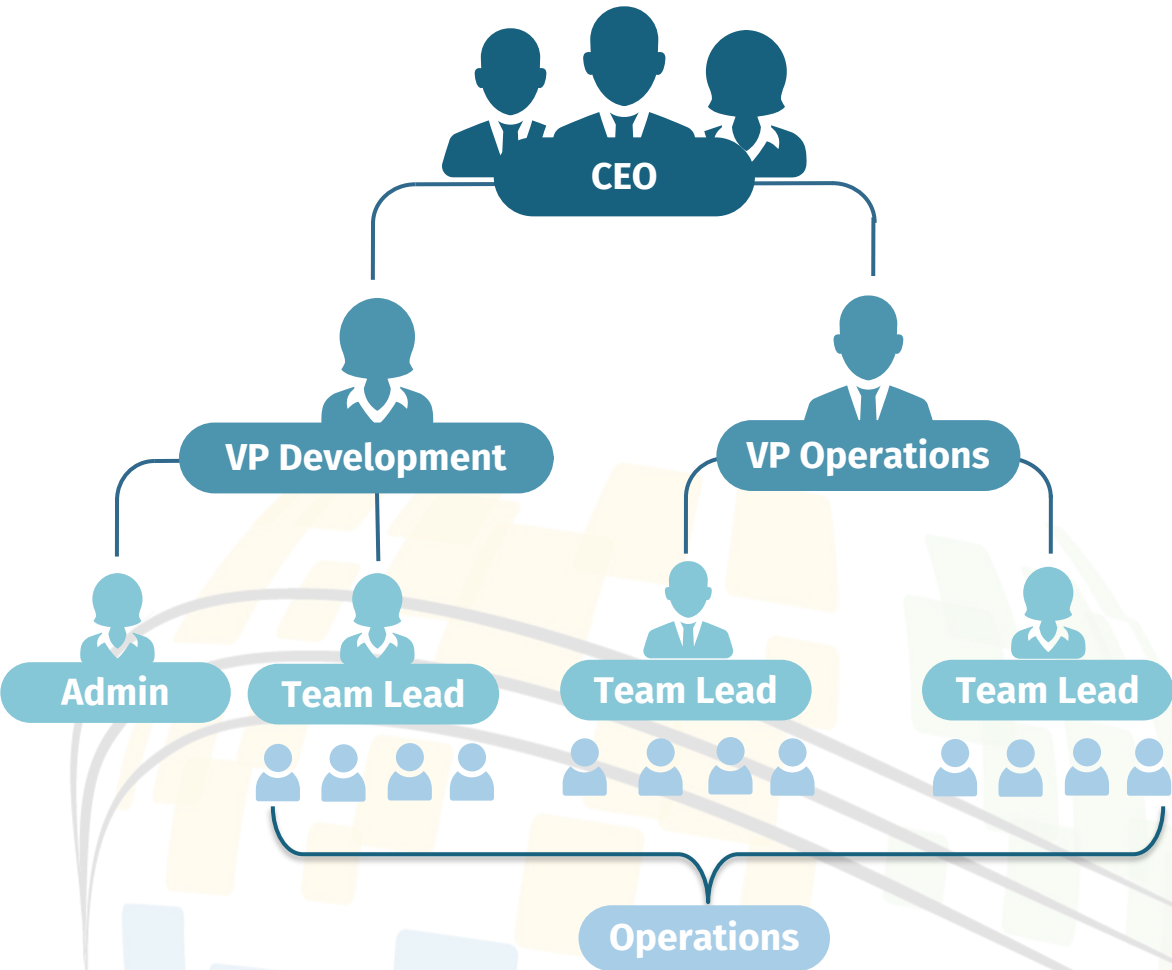
02 **Systems Dynamics** What factors influence decision-making within these organizational structures using a modeling and simulation platform?
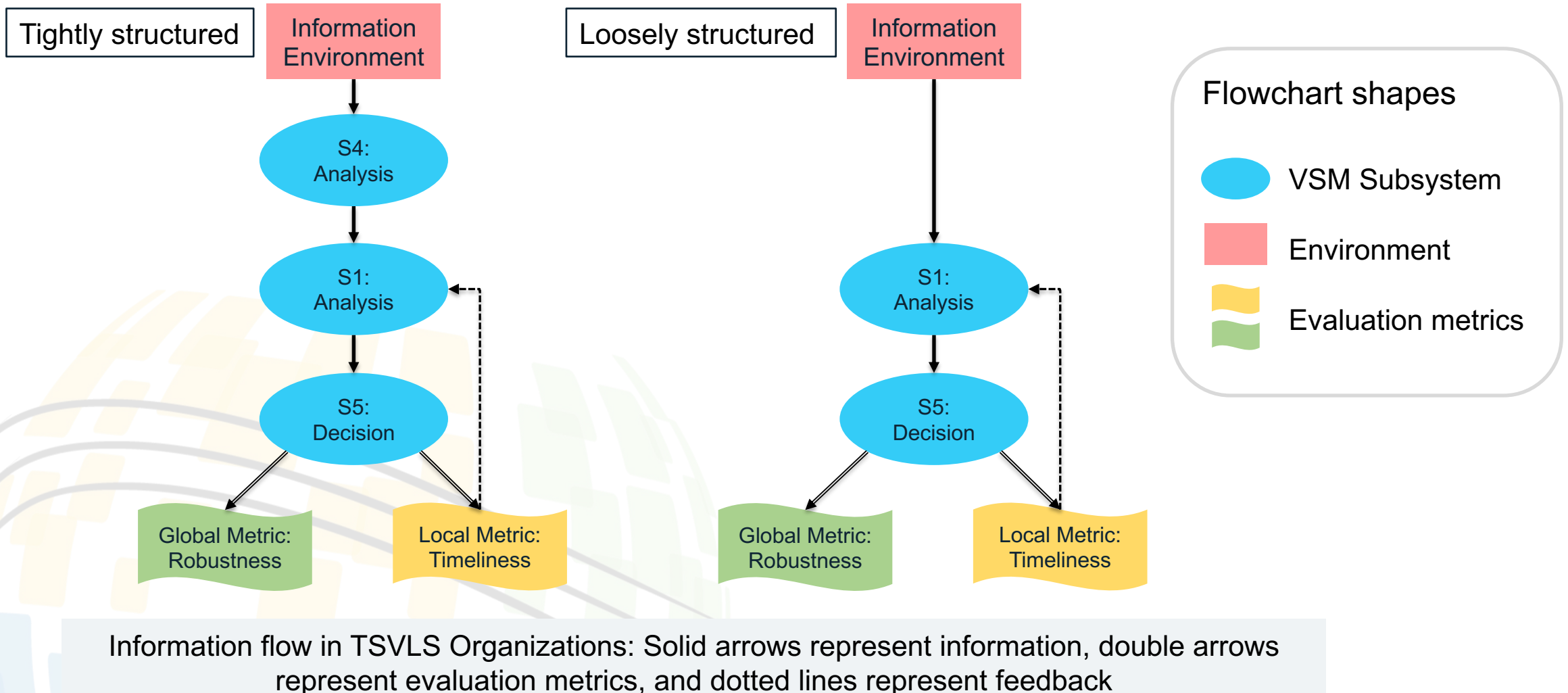
03 **Resilience Metrics** How could we measure the vulnerabilities and opportunities for improved performance?

| Background | Model Design | Results | Conclusion |

Tightly structured (TS) versus loosely structured (LS)

Background	Model Design	Results	Conclusion

TSVLS in Systems Dynamics Model

Information flow in TSVLS Organizations: Solid arrows represent information, double arrows represent evaluation metrics, and dotted lines represent feedback

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Model Parameterization

- Systems dynamics platform (Powersim Studio 10 Expert)
- Agents (i.e., organizational subsystems) make decisions based on time (assessment time) and confidence ratios (mere exposure effect for S4)
- Metrics of evaluation
  - How long does it take to make a decision? (local metric)
  - What is the robustness of the decision? (global metric)
- Feedback is determined by the local metric and expressed through resources for the agents (time to assess information for S1)
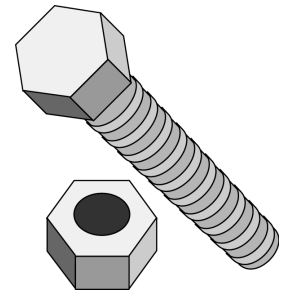
Tightly structured organizations process fewer amounts of information but may be more resilient to bad quality information

Local Evaluation- Timeliness

Proportion of Bad Information within the Environment

● TS ● LS

Global Evaluation- Robustness Against Bad Information

Proportion of Bad Information within the Environment

● TS ● LS
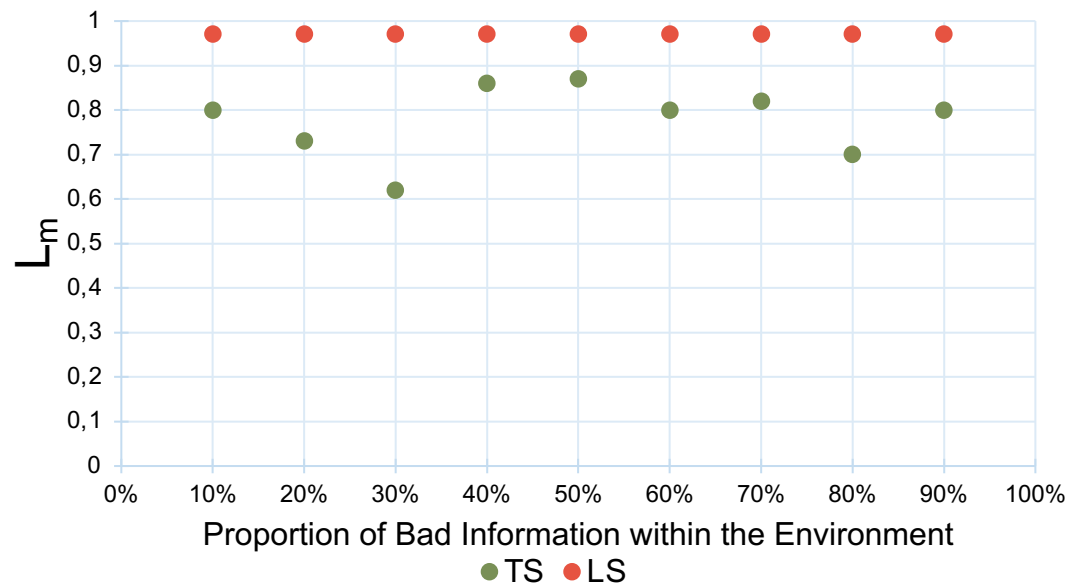
- LS organizations make timely decisions regardless of bad information proportion
- TS organizations make the least timely decisions when bad information levels are close to the confidence ratio (0.3)
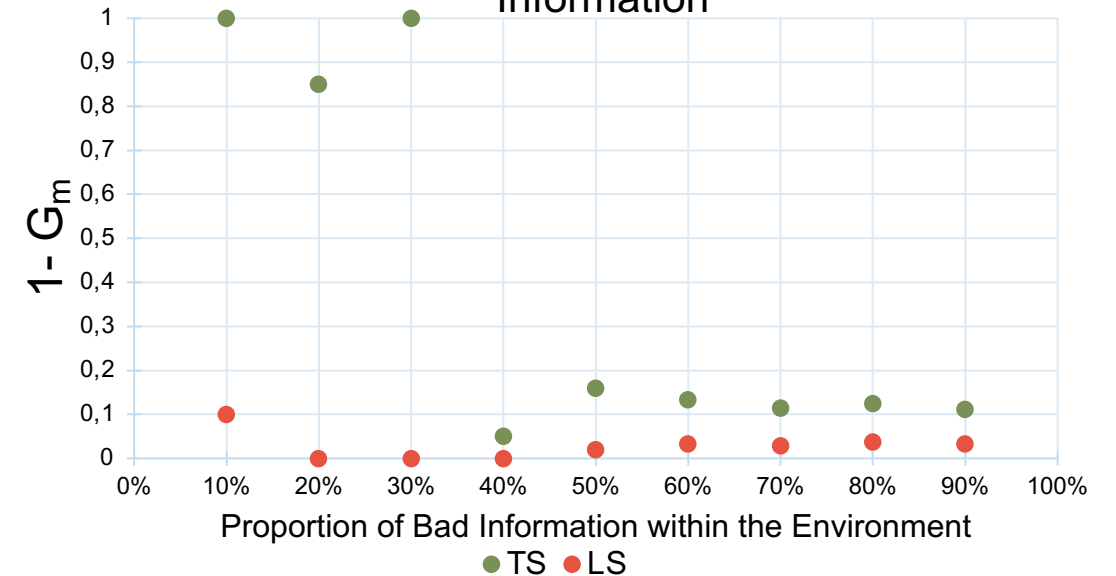
- LS organizations filter low amounts of bad information (0-10%) regardless of bad information proportions
- TS organizations filter high amounts of bad information (<85%) when bad information proportions are at or below confidence ratio (0.3)

# Ongoing work incorporates cognitive insights and differing information pulses
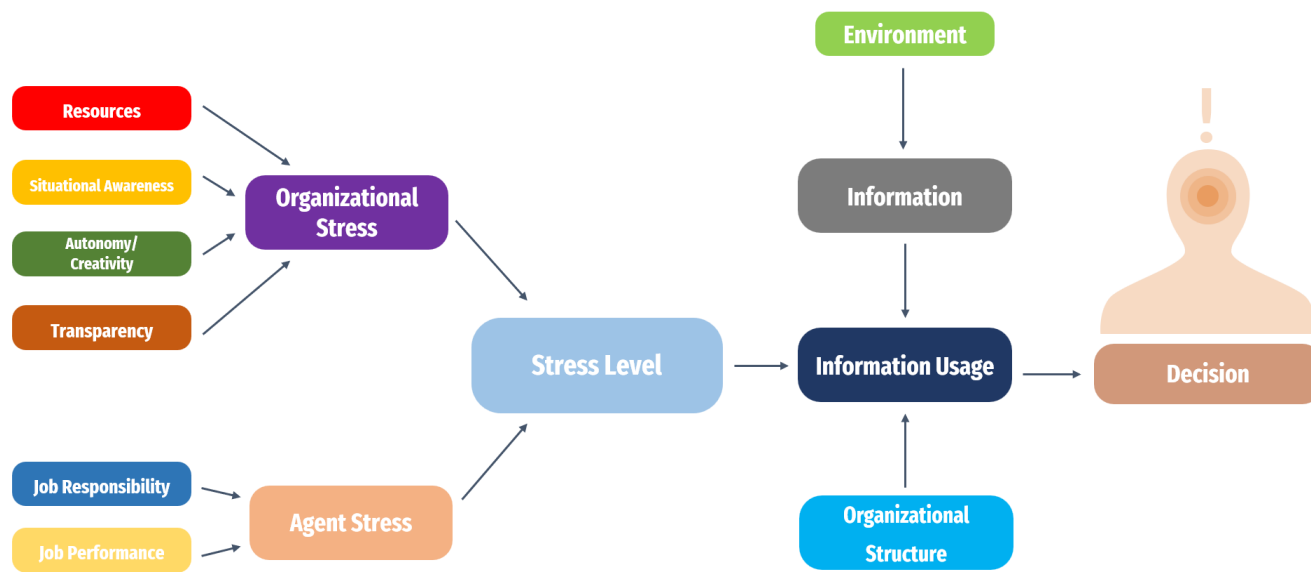
- Cognitive insights affect agent stress through organizational and agent factors
- Information usage (always pass, never pass, information confidence calculation) is determined by agent stress level
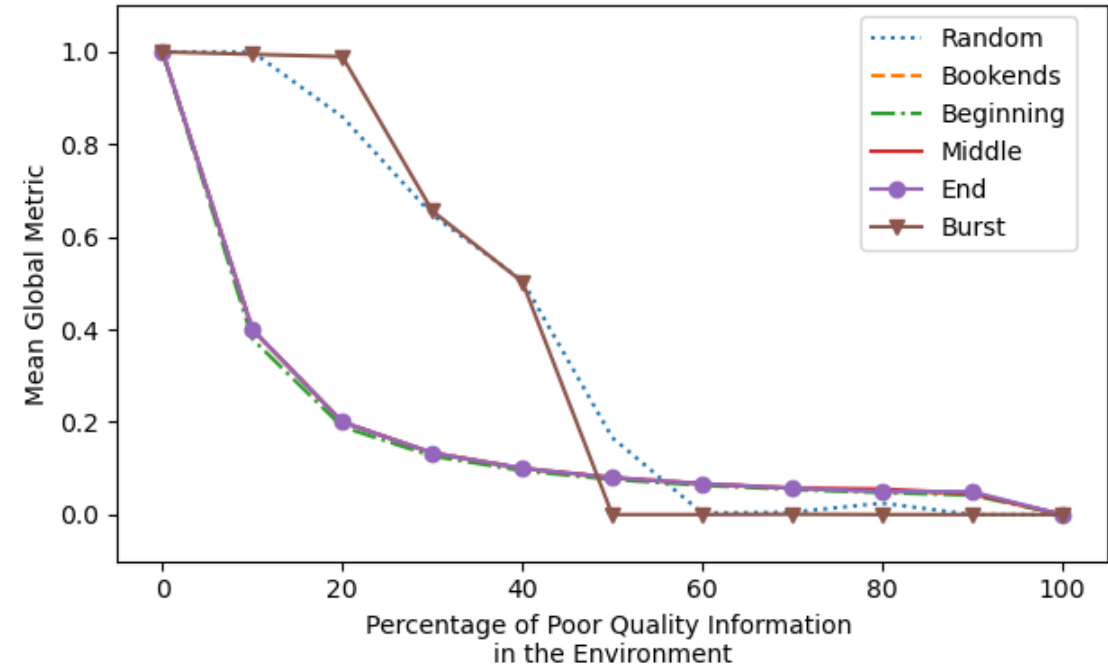
- Strategic patterning of information can model disinformation attacks
- PRELIMINARY RESULTS: Front or back loading information sequences with bad information can reduce organizational resilience.

Model extensions effectively replicate real-world instances of disinformation attacks and assessment of organizational resilience
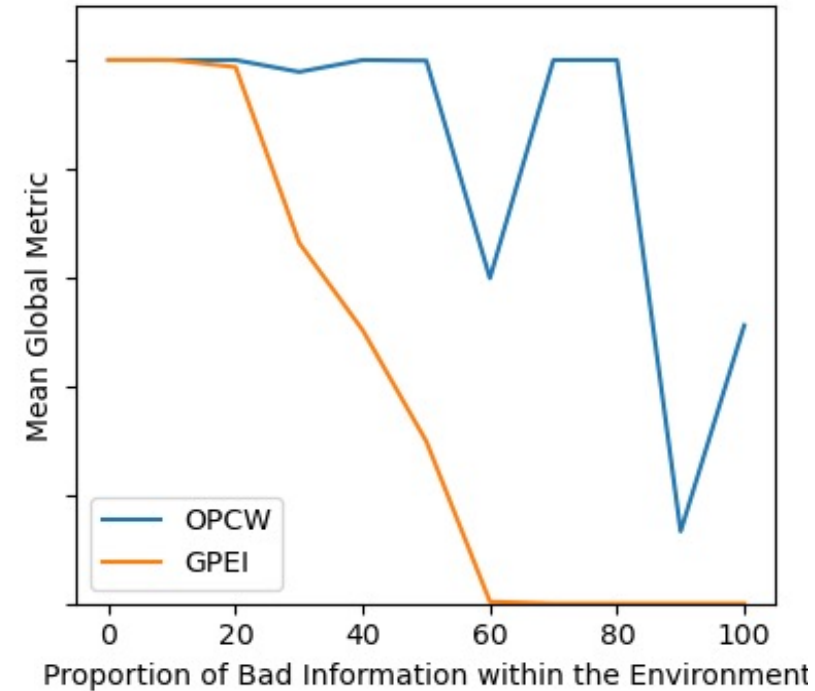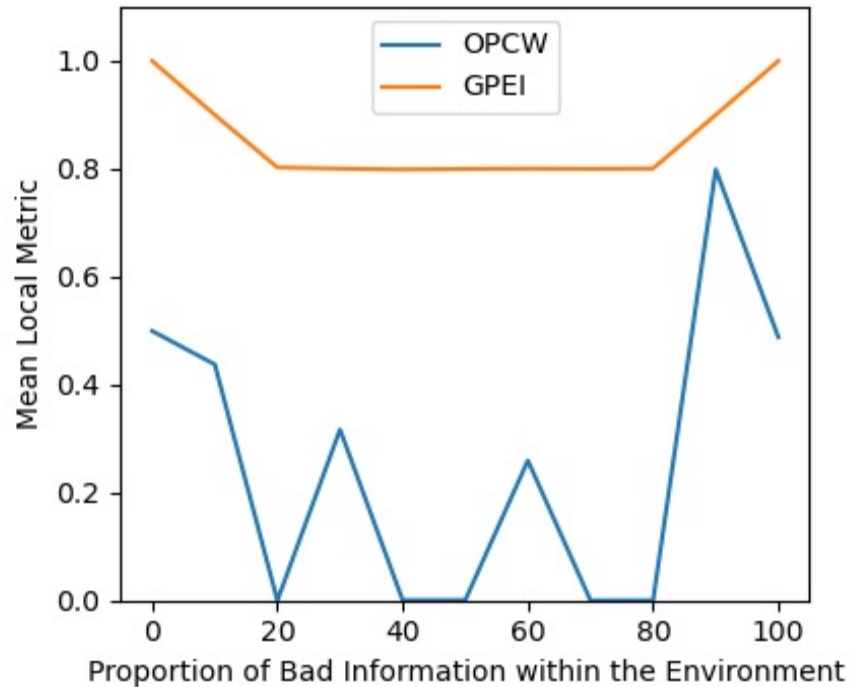
OPCW's decision-making varied based on information proportion, but filtered out more bad information than GPEI and made less timely decisions in most scenarios.

Key Takeaways

- Developed an integrated VSM-SD model for simulating information flows relevant to organizational decision-making

- Grounded in organizational theory, this simulation framework can be tailored to various organizational structures and characteristics

- Models effectively replicate impact of real-world instances of disinformation attacks on organizations' behaviors

- Simulation framework allows for proactive evaluation of influences that make organizations more vulnerable to disinformation

Acknowledgements

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Thank you for your attention! Questions?

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