Modeling interpersonal trust in distributed command and control teams

Karen M. Evans
Anna T. Cianciolo

Arwen E. Hunter
Linda G. Pierce

Note: The views expressed in this presentation are those of the authors and do not necessarily reflect the official policy or position of the Army
Overview

- **Goal**: Model impact of trust on **BEHAVIOR** in C2 (e.g., information sharing, collaboration)
  - Simulate trust's impact in future concepts experimentation
  - Develop training to help calibrate trust and build trust

- *Preliminary* model development
- Supports ARI effort to promote collaboration in network-enabled C2
Why Does Trust Matter?

C2: Trust information, judgment
- Commander
- Teammates
- Larger groups
  (all network users)
Why Does Trust Matter?

C2: Trust information, judgment
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- Teammates
- Larger groups (all network users)

Individuals
Collectives
Defining Trust

- Willingness of someone (*trustor*) to be vulnerable to the actions of another (*trustee*)
Defining Trust

- Willingness of someone (*trustor*) to be vulnerable to the actions of another (*trustee*)

- How to measure?
  - Expecting that the trustee's actions will be favorable
  - Absence of attempts to mitigate risk or gain control from trustee
Modeling Trust

- Understand the *observable impact* of trust
  - What trustor behaviors are enabled by trust judgments?
Modeling Trust

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  - What trustor behaviors are enabled by trust judgments?
- Understand *contributors* to trust
  - What trustee behaviors build trust?
Modeling Trust

- Understand the *observable impact* of trust
  - What trustor behaviors are enabled by trust judgments?
- Understand *contributors* to trust
  - What trustee behaviors build trust?
- Understand *when* trust has greatest impact
  - In C2, what situational factors influence behavior?
Method

Literature review: Scholarly and military literature
• Examined characteristics people evaluate when making trust judgments

Interview: 8 active-duty or recently retired Army officers with C2 staff experience
• Talked about trustee behaviors (cues) that build trust, trustor behaviors that result from trust, and factors that influence impact of trust on behavior

Observation: 2 Army C2 simulation exercises
• Noted trustee behaviors (cues) that convey trustworthiness, trustor behaviors that follow these cues, and situational factors that influence behavioral responses to these cues
What Trustee Behaviors Build Trust?

Goal: To identify trustee behaviors that convey trustworthiness
What Trustee Behaviors Build Trust?

- **Competence**
  - *Can do*: domain-specific knowledge and skills

**Individuals:**
- Sharing accurate information
- Mentioning second- and third-order effects in planning meetings

**Collectives:**
- Training
- Collaborative history
- Frequency of errors on C2 network
What Trustee Behaviors Build Trust?

- **Character**
  - *Will* do: Honesty, helpfulness, accountability

<table>
<thead>
<tr>
<th>Individuals:</th>
<th>Collectives:</th>
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<tbody>
<tr>
<td>• Accepting help from others</td>
<td>• Similarity of goals</td>
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<tr>
<td>• Prioritizing mission over</td>
<td>• Training</td>
</tr>
<tr>
<td>own career</td>
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<tr>
<td>• Sharing information honestly</td>
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What Trustee Behaviors Build Trust?

• **Dependability**
  – Does *consistently*: Predictability of actions

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<th><strong>Individuals:</strong></th>
<th><strong>Collectives:</strong></th>
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<tr>
<td>• Using consistent format in reports</td>
<td></td>
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<td>• Accessible when needed</td>
<td></td>
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<tr>
<td>• Meeting commitments</td>
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<tr>
<td>• Group similarity</td>
<td></td>
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<tr>
<td>• Interoperable C2 networks</td>
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Trust Model

Cues of individual team members' trustworthiness:
e.g., Quality of shared information; Focus on mission; Consistency of individuals' behavior

Cues of collective's trustworthiness:
e.g., Frequency of errors on network; Similarity of goals; Group diversity

Trust Judgment:
Expectation that individual team members will contribute positively to mission

Trust Judgment:
Expectation that entire team will contribute positively to mission
**Trust Model**

**Cues of individual team members' trustworthiness:**
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**Trust Judgment:**
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- Expectation that entire team will contribute positively to mission

What happens next?
How Does Trust Influence Behavior?

**Goal:** To identify aggregate behaviors associated with different levels of trust

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<tr>
<th>Specific Behaviors</th>
<th>Aggregate Behaviors</th>
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<tr>
<td>• More extensive double-checking</td>
<td>• Slow responses to trustee</td>
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<td>• One-way interactions</td>
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How Does Trust Influence Behavior?

<table>
<thead>
<tr>
<th></th>
<th>Trusted Individual</th>
<th>Trusted Collective</th>
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</thead>
<tbody>
<tr>
<td><strong>Trusted</strong></td>
<td>More frequent interactions with trustee; Rapid responses to trustee; Greater frequency of two-way interactions; Initiates interactions more often; Message content involves requests, confirmations, and even social chat; Message tone is informal</td>
<td>Frequent group-level / network interactions</td>
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<tr>
<td><strong>Collective</strong></td>
<td></td>
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<tr>
<td><strong>Un-trusted</strong></td>
<td>Reduced frequency of interactions with trustee; Slow responses to trustee; Rarely initiates interactions; Message content involves instruction and monitoring; Message tone is formal</td>
<td>Avoid group-level / network interactions; Establish SOPs</td>
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<tr>
<td><strong>Individual</strong></td>
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Aggregated Risk Management Behaviors:
- Frequency of private vs public communications; Frequency of directive, social, and reciprocated communications
Trust Model

What else influences behaviors?

Aggregated Risk Management Behaviors:
Frequency of private vs public communications; Frequency of directive, social, and reciprocated communications

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Trust Judgment:
Expectation that entire team will contribute positively to mission
When Does Trust Influence Behavior?

**Goal:** To identify conditions that cause trust to have strongest (and weakest) impact on behavior
When Does Trust Influence Behavior?

Behavior is likely to reflect trust judgments if there is:

- Moderate risk
- Low interdependence
- Uncertainty of procedures
- Ample time to change behavior
- Available alternatives
- Confidence in trust judgment
Trust Model

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Trust Judgment:
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Situational Factors:
- e.g., Perceived risk, Interdependence, Command structure, and SOPs

Aggregated Risk Management Behaviors:
- Frequency of private vs public communications; Frequency of directive, social, and reciprocated communications
Summary

• Through qualitative analysis, we have:
  – Developed a model of trust in C2 teams
  – Identified trustee behaviors that build trust
  – Identified trustor behaviors that reflect trust
  – Specified situational factors that influence the expression of trust

• In future quantitative analysis, we will:
  – Reduce model to most important elements
  – Investigate trust in C2 simulations
Thank you!

Questions?

Command Performance Research, Inc.
Karen M. Evans: KEvans@cpresearch.net
Anna T. Cianciolo: ACianciolo@cpresearch.net

Army Research Institute
Arwen E. Hunter: Arwen.Hunter@arl.army.mil
Linda G. Pierce: Linda.Pierce@faa.gov