The Effects of Individual and Team Characteristics, Organizational Design, Team Building and Trust on the Performance of Small Networked Teams

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Motivation

- The ability to collaborate is one of the key variables underlying the tenets of network-enabled operations.

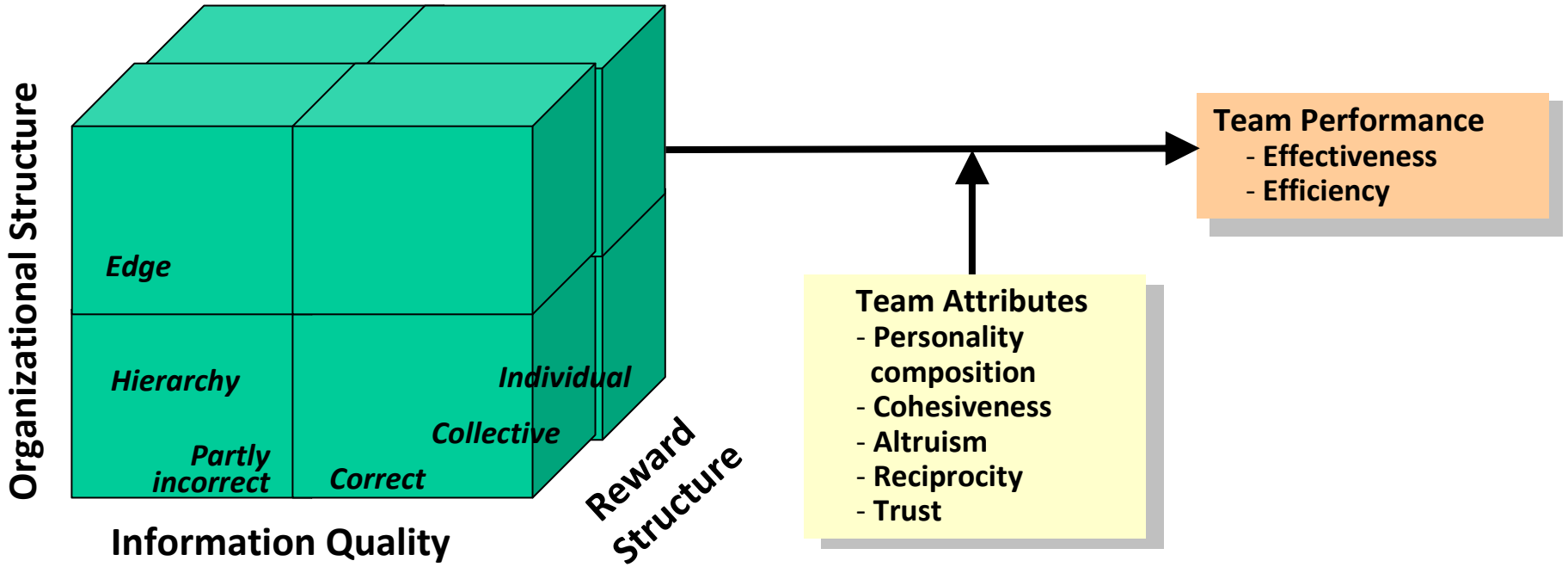
- The effectiveness of networked teams depends on
  - command and control (C2) structure,
  - degree of virtuality,
  - interaction tools,
  - human factors: personality, competencies , team member attitudes …,
  - team attributes: trust, reciprocity, altruism, team cohesion …,
  - group dynamics.

- Little is known about the moderating role of human factors.

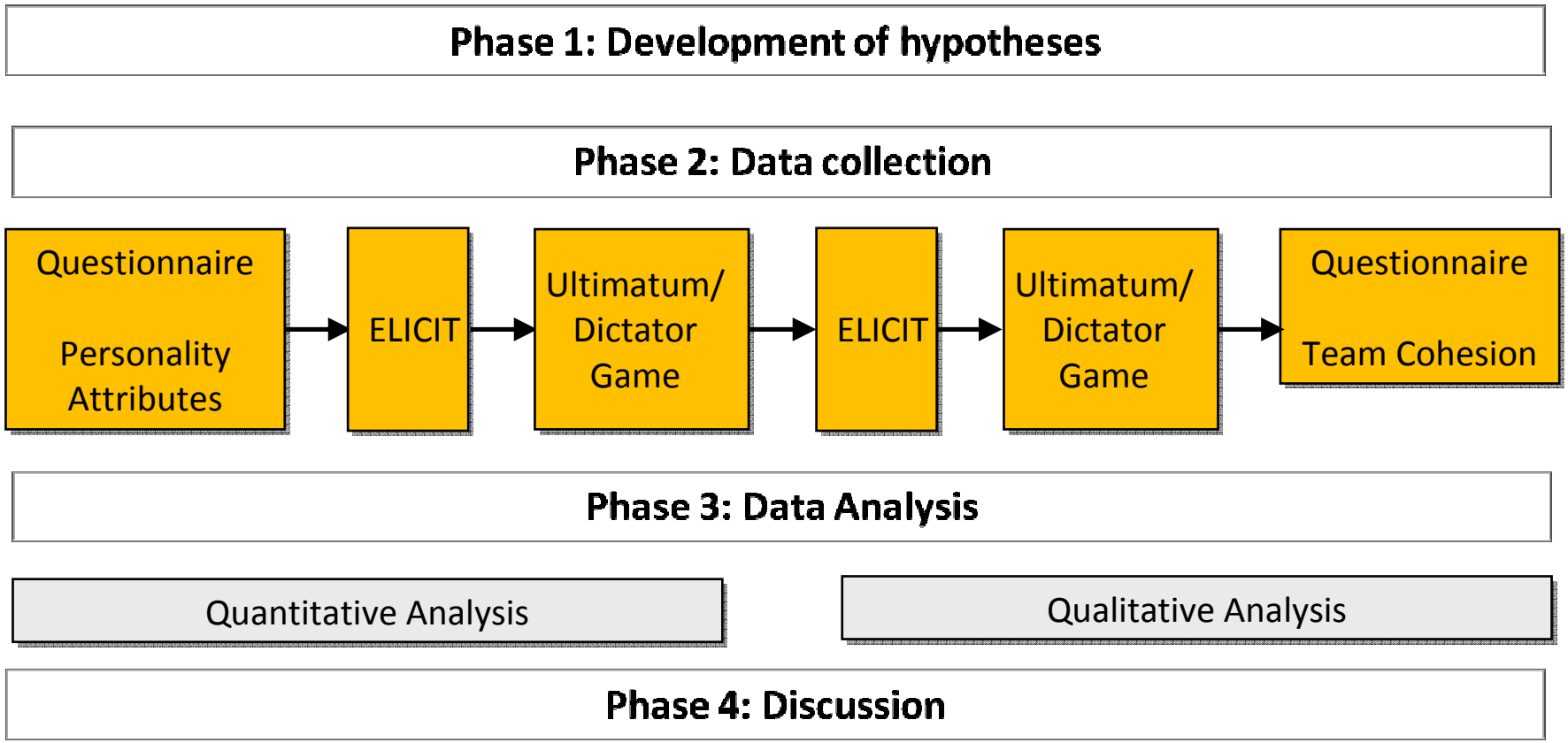
Research Design

Research Questions:

- To which degree does C2 structure affect team performance when information is ambiguous?
- To which degree does C2 structure affect team performance under the condition of individual and collective rewards?
- What are the moderating effects of individual human factors and team attributes on team performance given virtual interaction?



Research Process

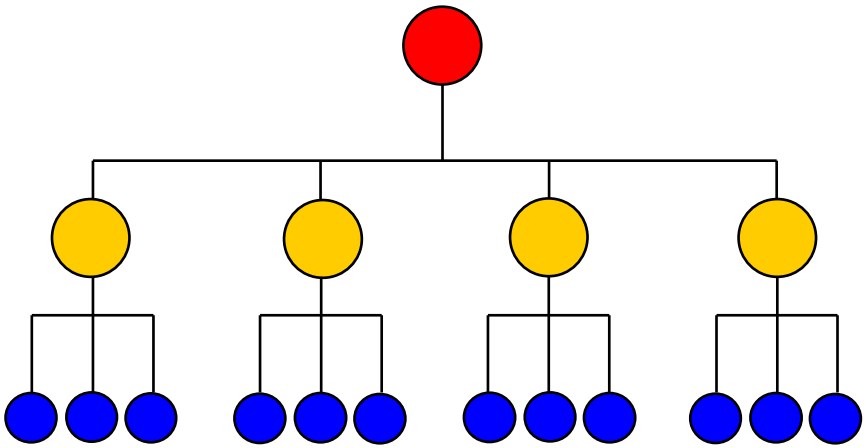


Dependent Variables, Moderators

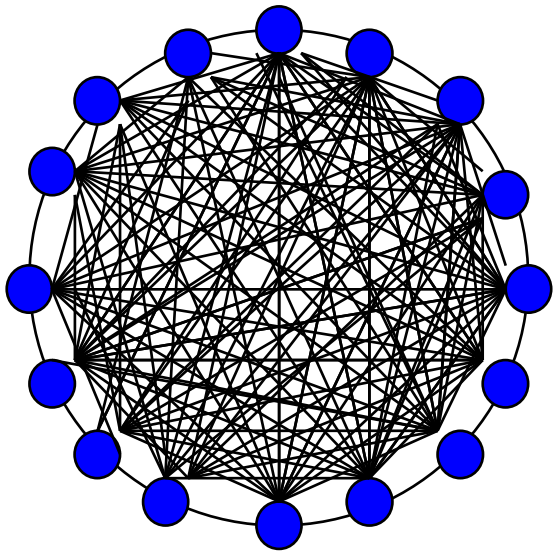
- Effectiveness
  - Number of correctly answered ELICIT questions (Who? What? Where? When?) – sum total, per participant
- Efficiency
  - Number of correctly answered ELICIT questions per action (posting, sharing, etc.)
  - Number of correctly answered ELICIT questions per time unit
- Team Cohesion :
  - Questionnaire
  - Percentage of reward offered by the allocator to the receiver in the Dictator and Ultimatum Game
  - Accepted offers in the Ultimatum Game (amount reward accepted, percentage of offers accepted)
- Shared Situational Awareness

Independent Variables: Organization Structure

Hierarchy



Flat, Peer-to-Peer
„Edge Organization“



Proposition: Edge organizations outperform hierarchical organizations in team performance in terms of effectiveness and efficiency.

Independent Variable: Information Quality

Correct

Tornado Recce

Risk of Non-Detection: low
Risk of False Alarm: low

Partially incorrect

Tornado Recce

Risk of Non-Detection: increasing
Risk of False Alarm: increasing

Proposition: Teams operating with entirely correct information outperform teams operating with partly incorrect information in terms of effectiveness and efficiency.

Independent Variables: Reward Structure

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Individual Rewards

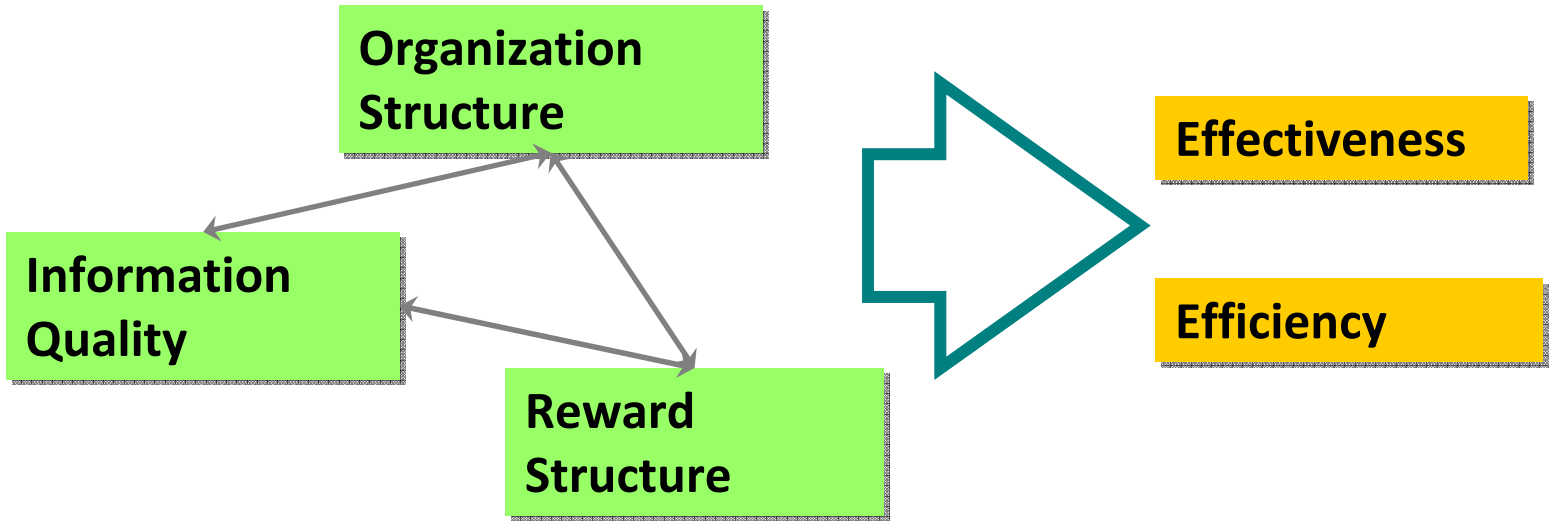
- Reward depends on individual performance
- Equity principle

Collective Rewards

- Reward depends on team performance
- Equality principle

Proposition: Teams operating under conditions of collective rewards outperform teams working under conditions of individual rewards in terms of effectiveness and efficiency.

Independent Variables: Interaction effects



Proposition: Organization structure (edge vs. hierarchy), information quality (correct vs. partly incorrect) and reward structure (collective vs. individual) interact as to jointly affect team performance in terms of effectiveness and efficiency.

Moderating Variables: Personality

Emotional Stability	**Openness to Experience**
Extraversion	**Conscientiousness**
Agreeableness	**Ambiguity Tolerance**

*Proposition: Team members' extent of emotional stability moderates the effect of **organizational structure** (edge vs. hierarchy) …*

*Proposition: Team members' extent of emotional stability moderates the effect of **information quality** (correct vs. partly incorrect information) …*

*Proposition: Team members' extent of emotional stability moderates the effect of **reward structure** (collective vs. individual) …*

…on effectiveness and efficiency.

Moderating Variables: Team Attributes (Emergent)

Trust	**Altruism**
Reciprocity	**Cohesiveness**

Propositions: Trust between team members moderates the effects of

- *organization structure (edge vs. hierarchy) on team performance in that the advantage of edge organizations over hierarchical organizations …*
- *information quality (correct vs. incorrect) on team performance in that the advantage of settings with correct information over settings with partly incorrect information …*
- *reward structure (collective vs. individual) on team performance in that the advantage of settings with collective reward over settings with individual reward …*

… decreases with higher levels of trust.

Proposition: Hierarchical organizations experience a more unfavorable change in the level of interpersonal trust in the process of collaboration than edge organizations.

Trust in a team may be defined as the belief that an "individual or group (a) makes good-faith efforts to behave in accordance with any commitments both explicit and implicit, …." (Cummings & Bromley, 1996).

Moderating Variables: Team attributes (Emergent)

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Trust	**Altruism**
Reciprocity	**Cohesiveness**

Propositions : Reciprocity between team members moderates the effects of

- *organization structure (edge vs. hierarchy) on team performance in that the advantage of edge organizations over hierarchical organizations*
- *information quality (correct vs. incorrect) on team effectiveness and efficiency in that the advantage of settings with correct information over settings with partly incorrect information*
- *reward structure (collective vs. individual) on team effectiveness and efficiency in that the advantage of settings with collective reward over settings with individual reward*

… decreases with higher levels of reciprocity.

Strong reciprocity is a predisposition to cooperate with others, and to punish (at personal cost, if necessary) those who violate the norms of cooperation, even when it is implausible to expect that these costs will be recovered at a later occasion (Gintis, et al., 2005).

Reciprocity is positively correlated with team performance as residual claimancy by team members can provide sufficient incentives for mutual monitoring, and thus support high levels of team performance (Carpenter, et al., 2007).

Experiment Design to Measure Reciprocity and Altruism

Ultimatum bargaining game

Amount of monetary units (p) is divided among two players (P1=allocator, P2=receiver). P1 offers P2 specified share (x) of (p). P2 may
- accept: P2 receives x; P1 receives p-x
- reject: neither player receives anything

Allocation = indicator of **reciprocity**

Dictator game

P1 (allocator) determines the allocation of the amount of monetary units.

P2 (receiver) only receives what the proposer has not allocated to himself.

Allocation = indicator of allocator's **altruism**

Linking ELICIT and Ultimatum / Dictator Game :

- Half of the teams play Dictator and the other half the Ultimatum Game
- Collective rewards: Teams obtain an amount of money depending on their performance in an ELICIT run. This amount is split up such that 9 of the 17 the team players play the role of the allocator and the others the role of receiver according to the Ultimatum Game or Dictator Game.
- Individual rewards: The amount of money to be distributed depends on individual performance and team performance in the ELICIT run. Two rounds of Ultimatum / Dictator such that each player assume both roles (proposer, receiver).

Sample and measurement procedure

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	1st round of ELICIT and Ultimatum / Dictator Game			2nd round of ELICIT and Ultimatum / Dictator Game			
Game	Organization Structure	Information Quality	Reward Structure	Organization Design	Information Quality	Reward Structure	**Change**
A	Edge	Correct	Individual	Hierarchy	Correct	Individual	**E -> H**
B	Edge	Correct	Collective	Hierarchy	Correct	Collective	**E -> H**
1	Hierarchy	Incorrect	Collective	Hierarchy	Incorrect	Collective	**-**
2	Hierarchy	Incorrect	Individual	Hierarchy	Incorrect	Individual	**-**
3	Edge	Incorrect	Collective	Edge	Incorrect	Collective	**-**
4	Edge	Incorrect	Individual	Edge	Incorrect	Individual	**-**
5	Hierarchy	Incorrect	Collective	Edge	Incorrect	Collective	**H -> E**
6	Hierarchy	Incorrect	Individual	Edge	Incorrect	Individual	**H -> E**
7	Edge	Incorrect	Collective	Hierarchy	Incorrect	Collective	**E -> H**
8	Edge	Incorrect	Individual	Hierarchy	Incorrect	Individual	**E -> H**

Proposition: Perpetuation and change of organization structure between the first and second experimental run (edge vs. hierarchical organization) have different effects on learning in the team measured in terms of effectiveness and efficiency.

Anticipated results and practical implications

- **Theoretical implications:**
  Enrichment of our current understanding of relations between individual attributes, organizational structures, team building, robustness of teams vis-à-vis incorrect information, reward structure, team processes, and collaborative decision-making.

- **Limitations:**
  Transferability from the game setting to real world scenarios (typical of experimental settings); Game setting needs to be validated, e. g., by means of case studies in military domains and cross validation with virtual teams

- Practical implications:
  Team staffing, team training.