



Norwegian Defence
Leadership Institute

The Pros and Cons of Network Centric Warfare: Preliminary Results from Empirical Investigations

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11th ICCRTS, Cambridge, UK, 2006



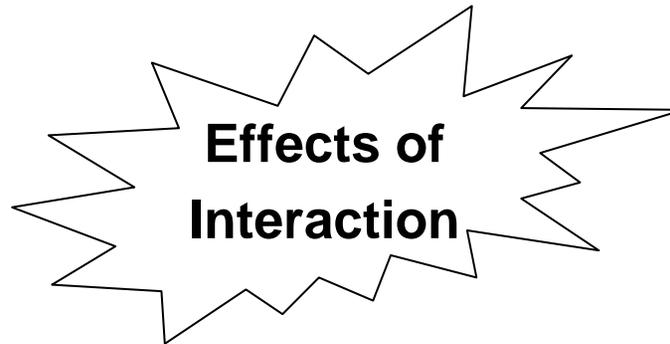
Background

- ❑ The study to be referenced is part of the research program HADMICS (Human Aspects of Decision Making in Complex Systems), started 2003.
- ❑ The first to *systematically* study inter-relationships between individual, organizational and technological factors, and their impact on performance in real Norwegian multi-level command organizations.
- ❑ The studies are to be replicated in school environments (military and civilian) from September 2006.



Research Framework

**Organisational
Factors**



Individual Factors



The Value of Studying Interactions

- ❑ Bringing in network technology in a command organization usually means we want to get more information (data) to more people.
- ❑ But, contrary to analytical "wisdom", more information is not always good when making decisions in complex environments.
- ❑ Evidence-based research shows that it is possible to identify conditions for where more information is better, and where more information is actually counter-productive.
- ❑ We want to add to this evidence, with experiments set in real command organizations and military school environments.

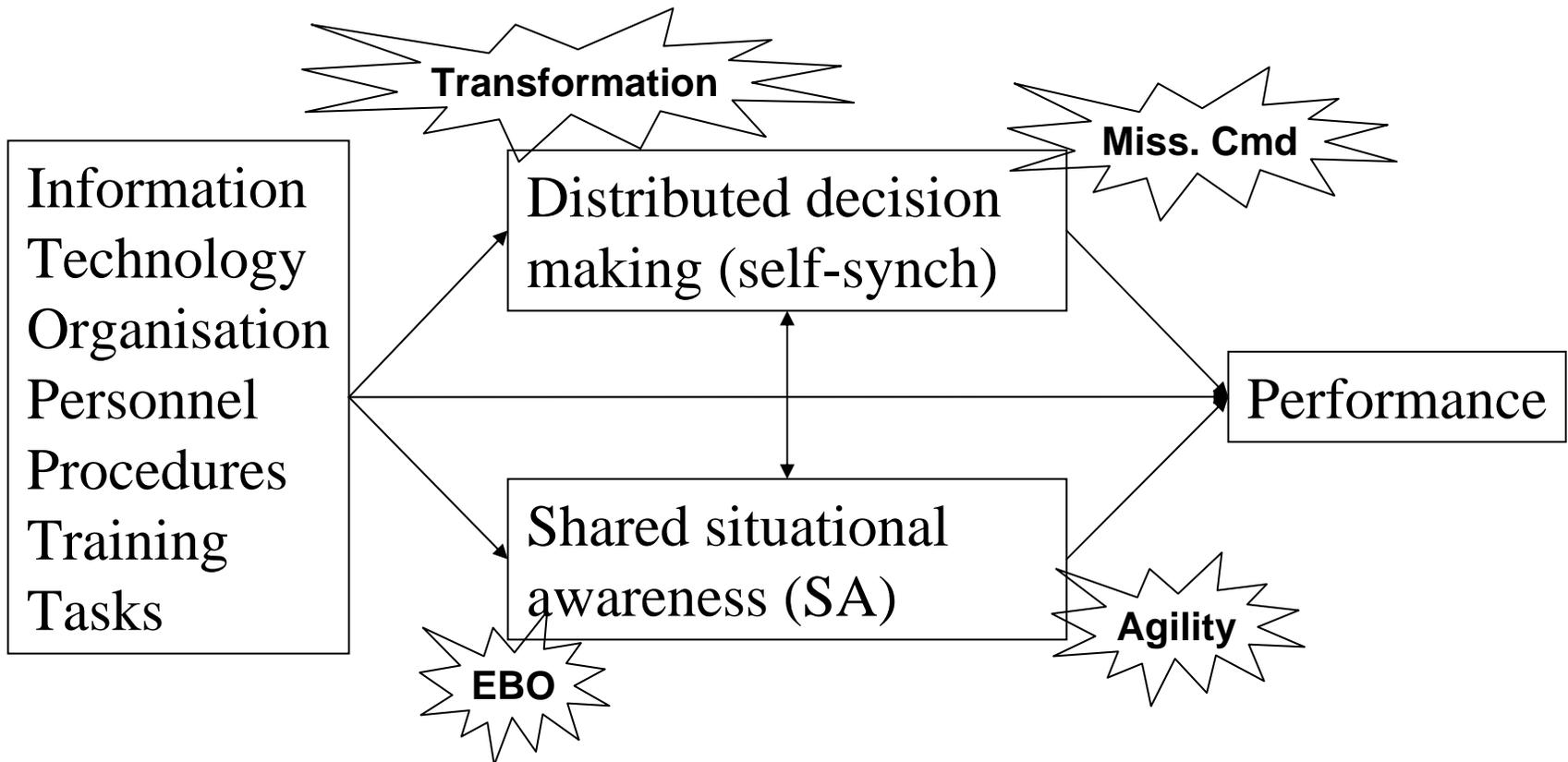


Mission Effectiveness in the NCW Perspective

”Conditions”

Process

Outcome

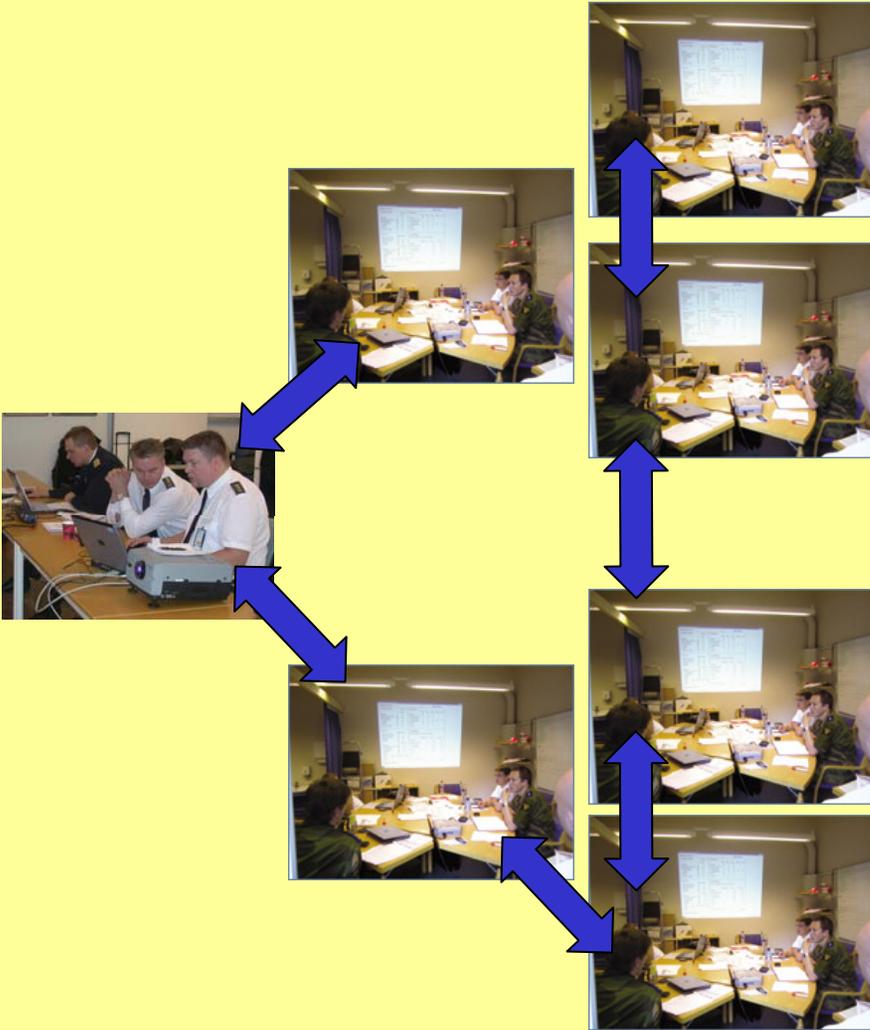




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Experimental Testbed: The "Learning Laboratory"

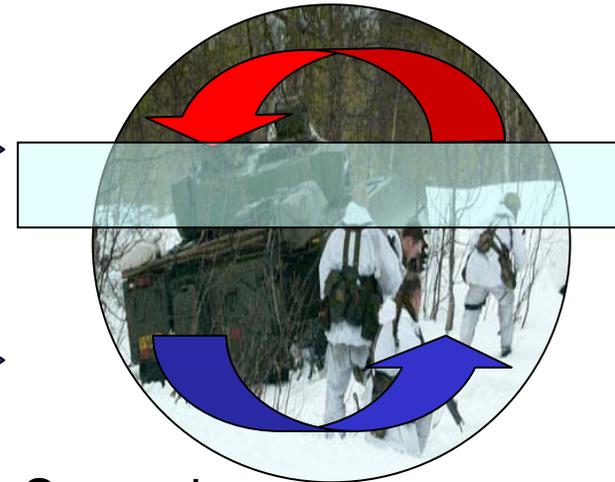
Decision-makers



Information



Micro-world



Scenario

Basic components

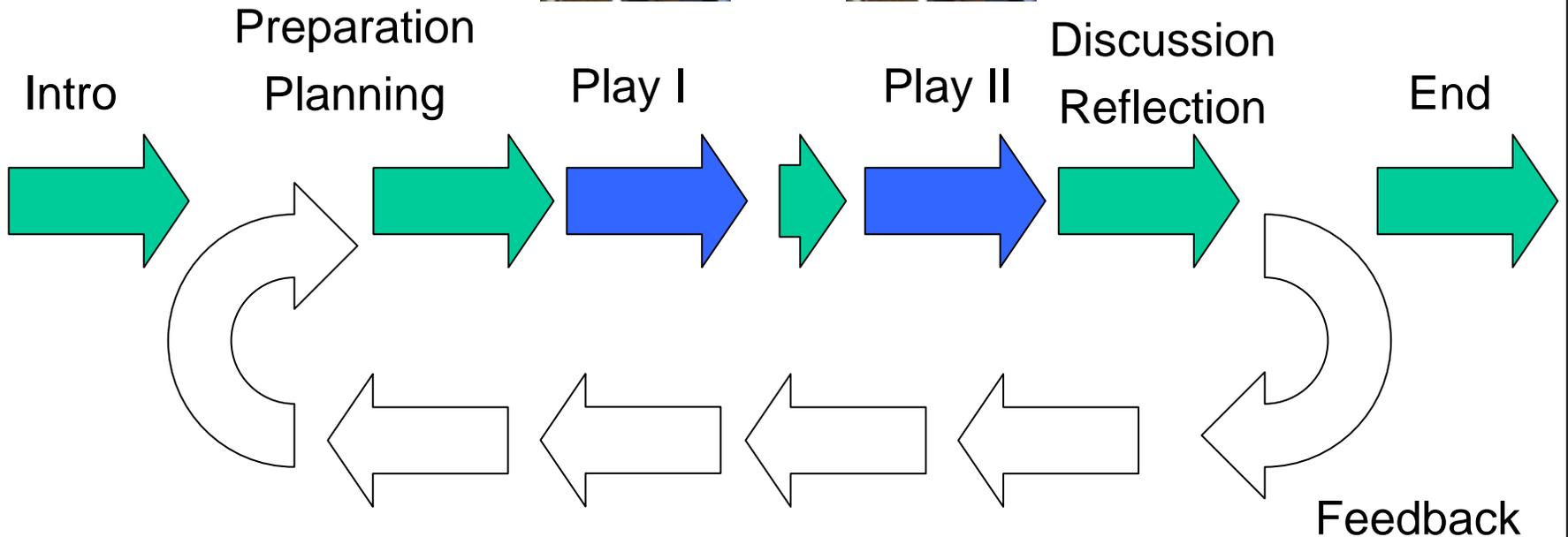
Events

Physical evolvment

Information flow



Mode of Operation





***Snapshots from demos
and actual experiments***



Operational picture



Info management



Situation assessment
(supported by high-res
flatbed display unit CODS)



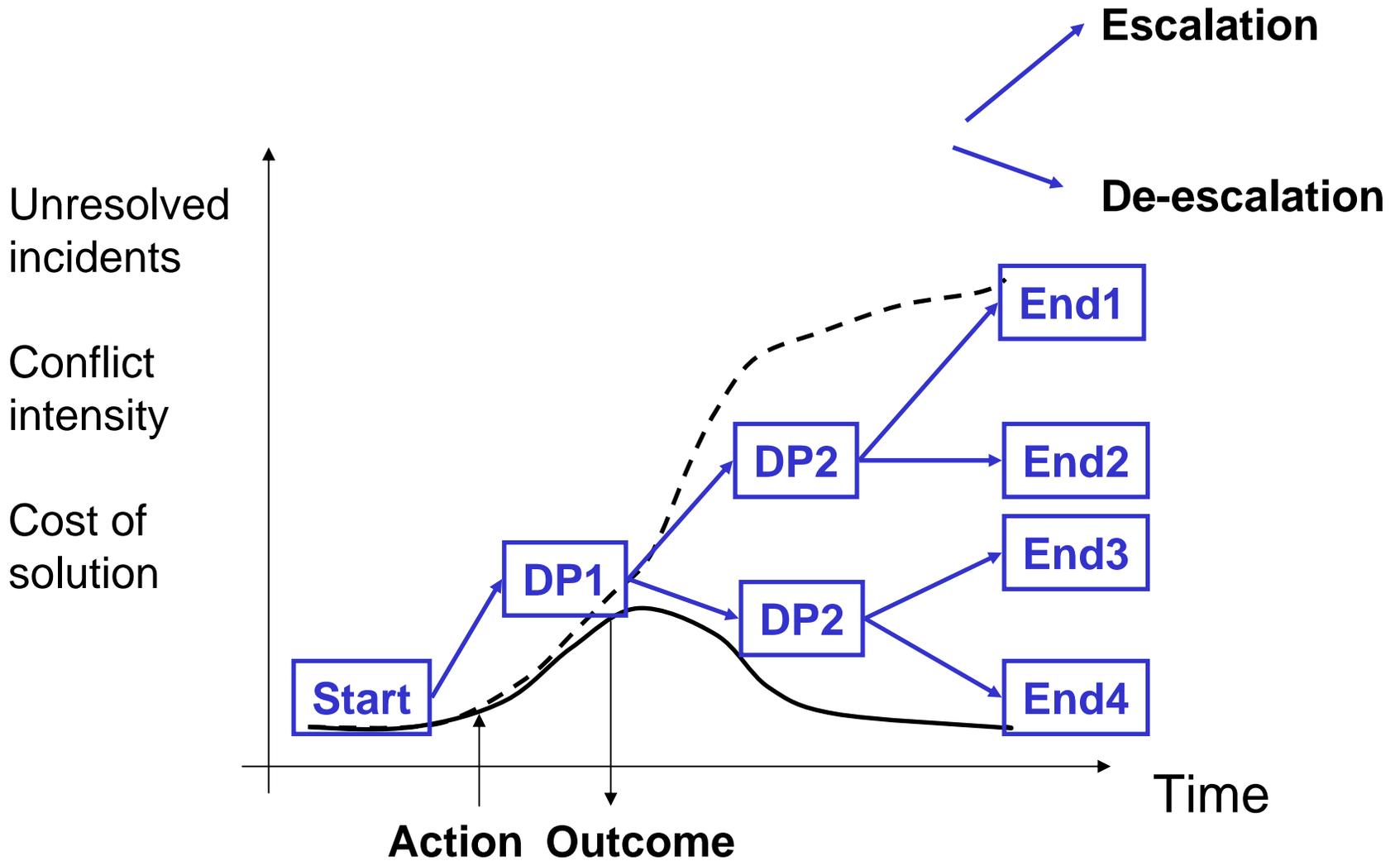
Debrief/discussion



Decision making



Generic Problem Structure of Crisis Management





KLOKKE
01-09-2004 08:00:00

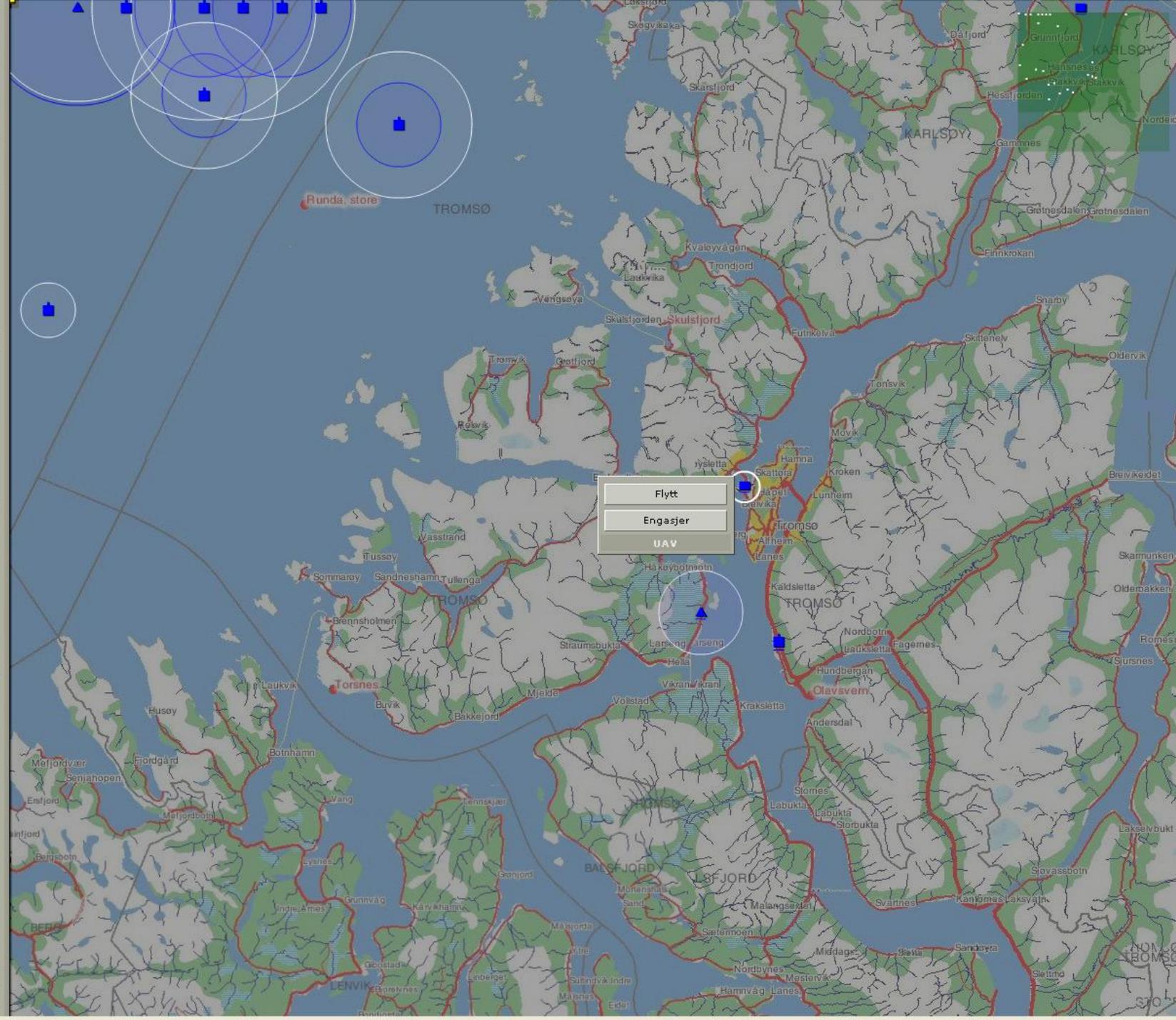
KART
100%
 Vis kart Status
 Sensor Effekt
 Retning
XY: 753 - 497

KOMMANDO
Fart: Kraft:
0
Offensiv/Defensiv:
 Nøytral
 Offensiv
 Defensiv
Ikke aktiv

OBJEKTINFO
Navn: UAV
Info: UAV
Eier: s3
Status: 100%
Kapas: 50
Fart: 0 km/t
kurs: 269°
UTM: 33
UTM: 642471 E 642471 N

BLAATT LAG
s1: (MTB)
s2: (FOHK)
s3: (Sensorer)
s4: (TG)
s5: (USS-KV)
s6: (ISTAR)
s7: (SB90)

Avslutt



Flytt
Engasjer
UAV



KLOKKE

01-09-2004 12:30:00

KART

100%

Vis kart Status

Sensor Effekt

Retning

XY: 771 - 693

KOMMANDO

Farv:

Offensiv/Defensiv:

Neutral
 Offensiv
 Defensiv

Aktivert...

OBJEKTINFO

Vaktlag a

Vaktlag b

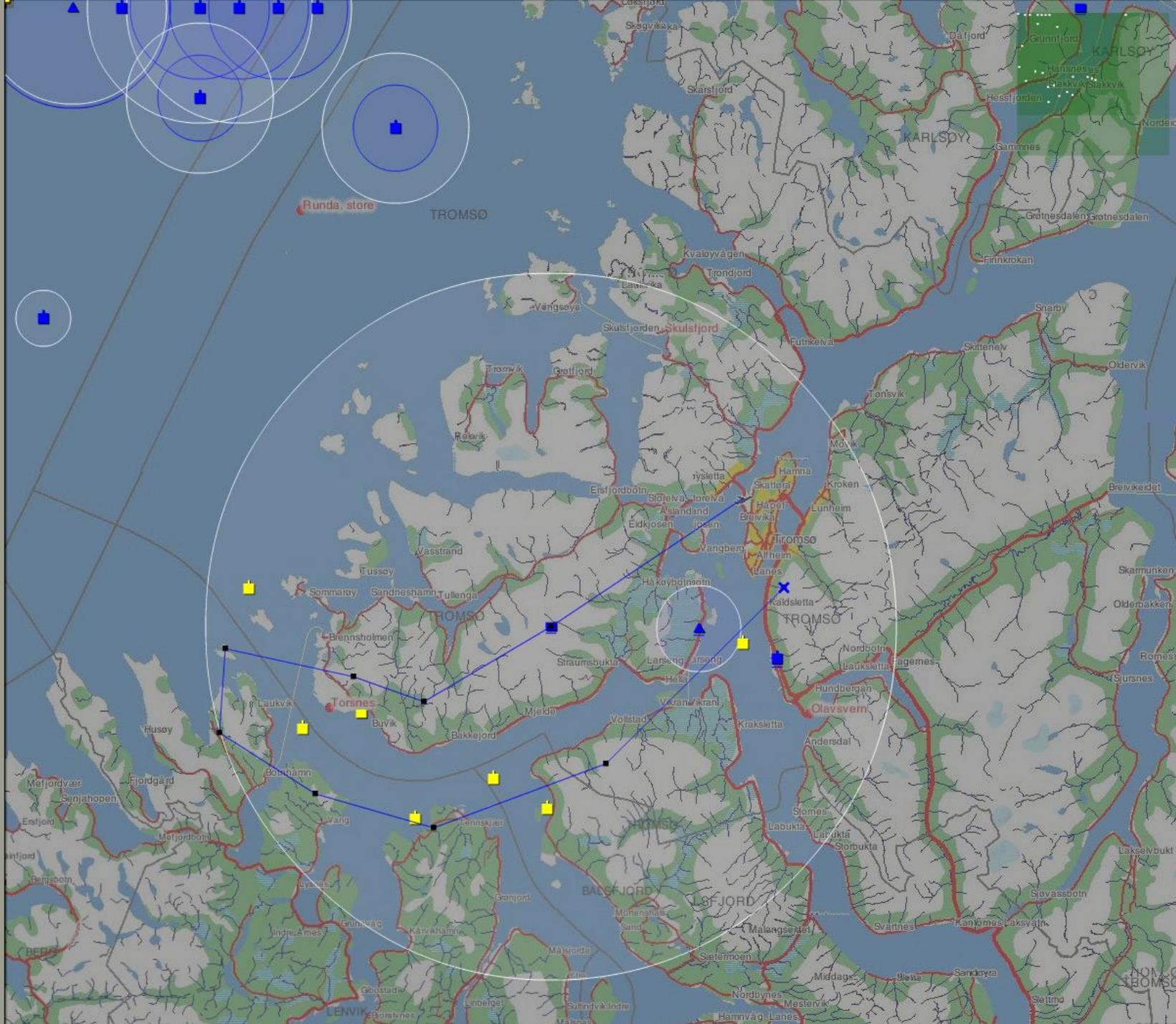
UAV

Orion

BLAÅTT LAG

- s1: (MTB)
- s2: (FOHK)
- s3: (Sensorer)**
- s4: (TG)
- s5: (USS-KV)
- s6: (ISTAR)
- s7: (SB90)

Avslutt





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Example Command Structures: Hierarchy and Network

Scenario, organization and resources

Assignments:

Directorate for
civil protection
and emergency
planning

The department
of justice and
the police

The Norwegian
Military
Intelligence
Service

Operational level

Operational
Military 1, Police 2 and Search and Rescue 3

Tactical level

Tactical Military Commander 10

Tactical Police Commander 11

Tactical Rescue Commander 12

Tactical Military Crew 4

Tactical Military Crew 5

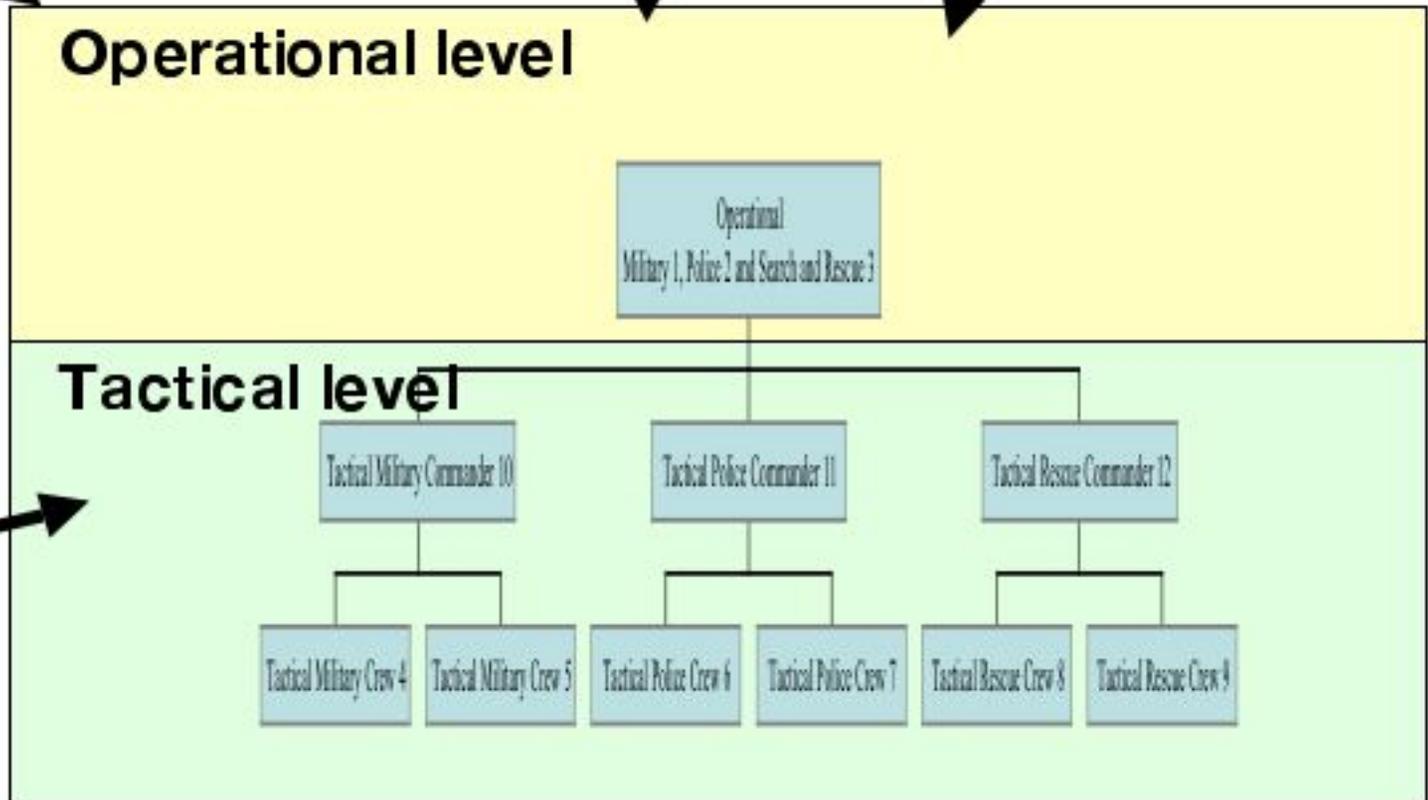
Tactical Police Crew 6

Tactical Police Crew 7

Tactical Rescue Crew 8

Tactical Rescue Crew 9

The National
Situational
Assessment
Centre

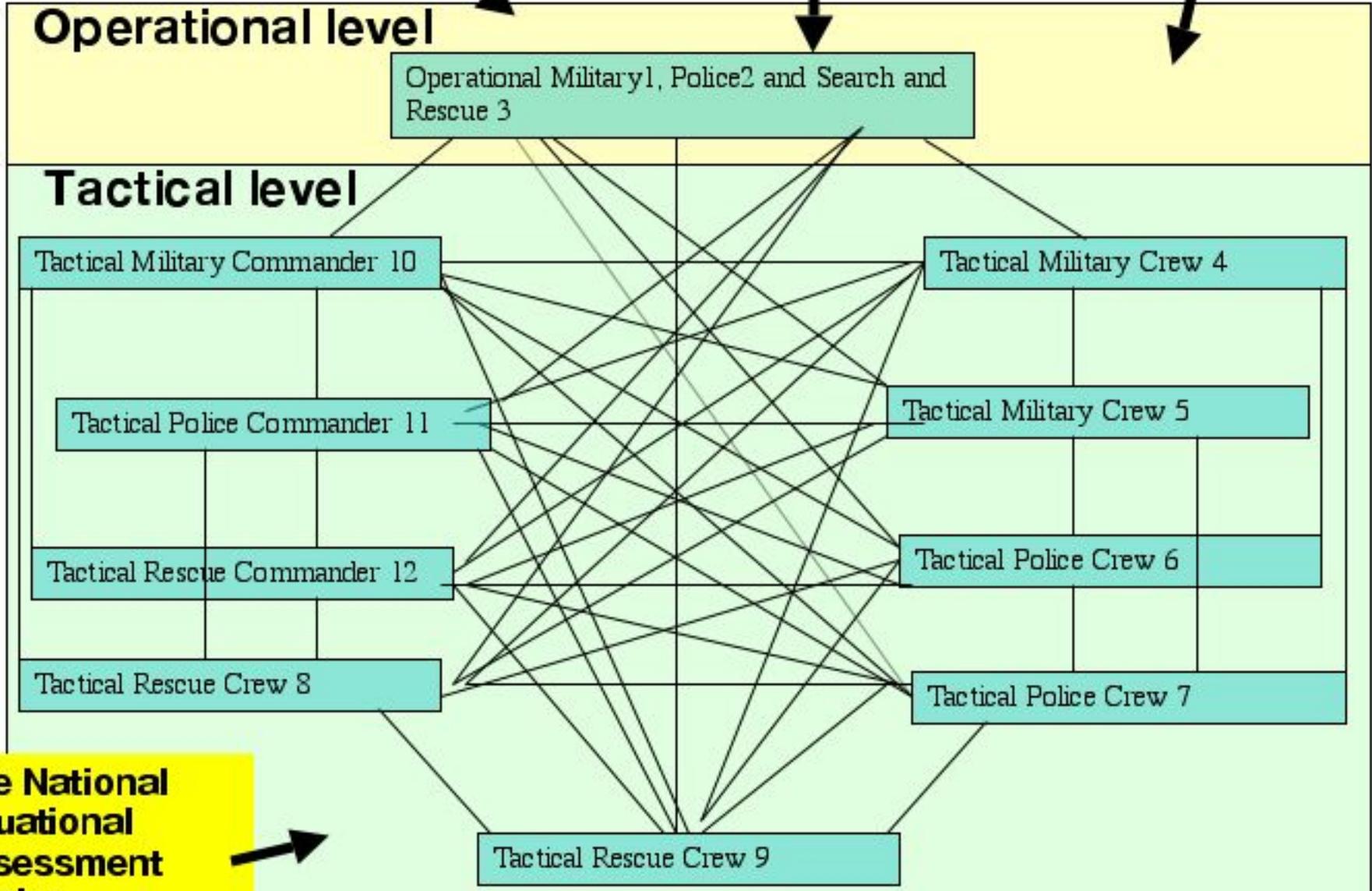


Assignments:

Directorate for civil protection and emergency planning

The department of justice and the police

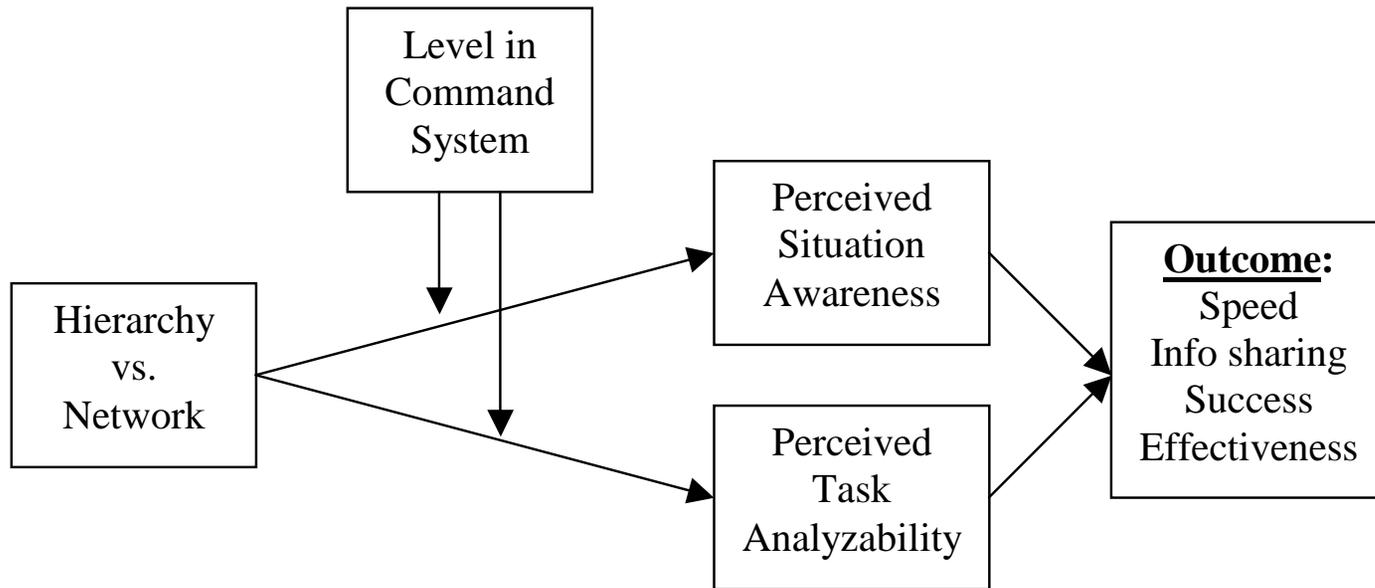
The Norwegian Military Intelligence Service



The National Situational Assessment Centre



Research Model





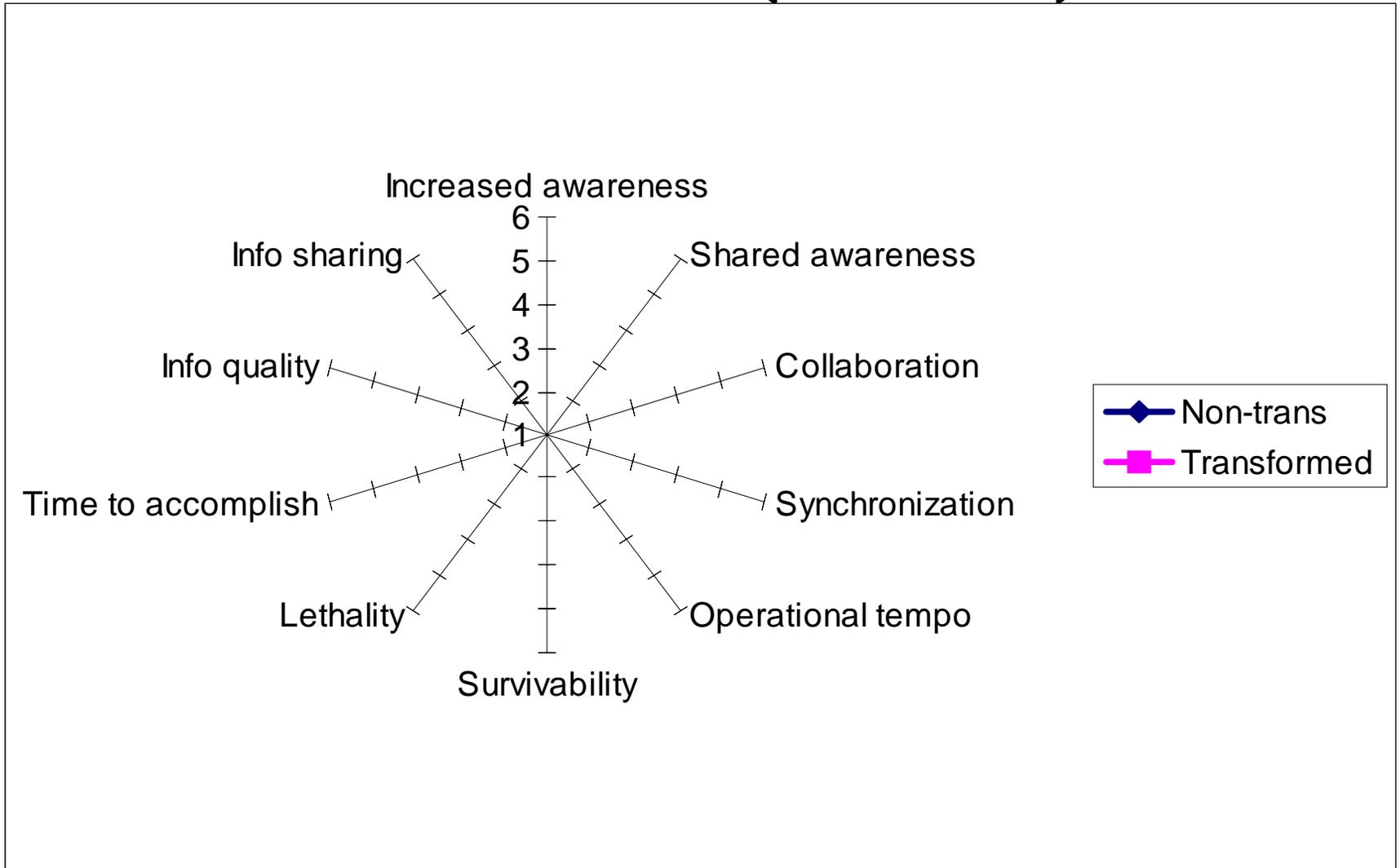
Hypotheses

- ❑ Advantages of Net-Centric Command Organisation:
 - Increased Op-Tempo
 - Increased Information Sharing
 - Increased Degree of Success
 - Improved Situational Awareness
 - Increased Understanding of Task (Analyzability)

- ❑ ... as Opposed to a Hierarchical Command Structure

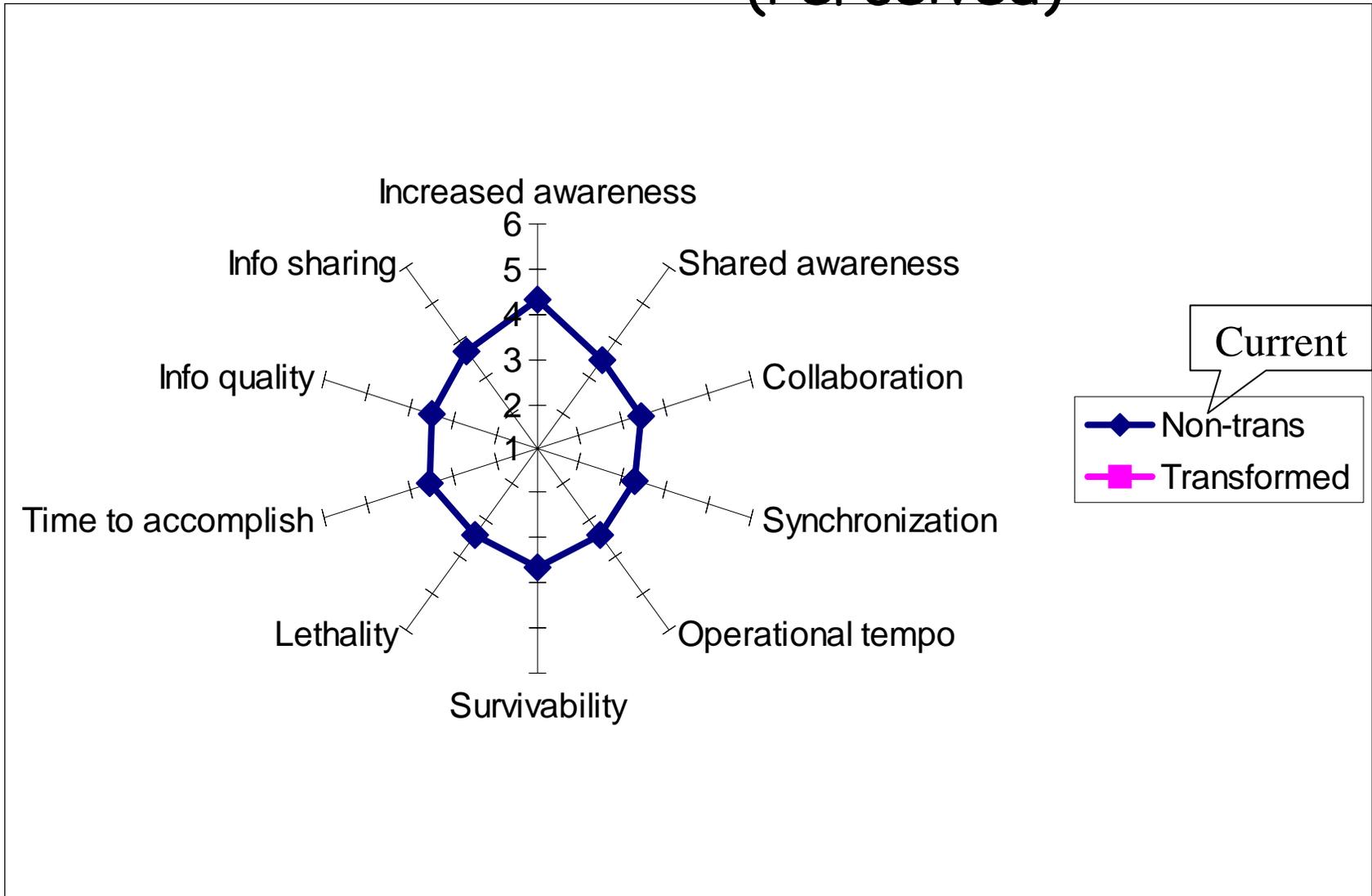


Measuring Effectiveness (Perceived)



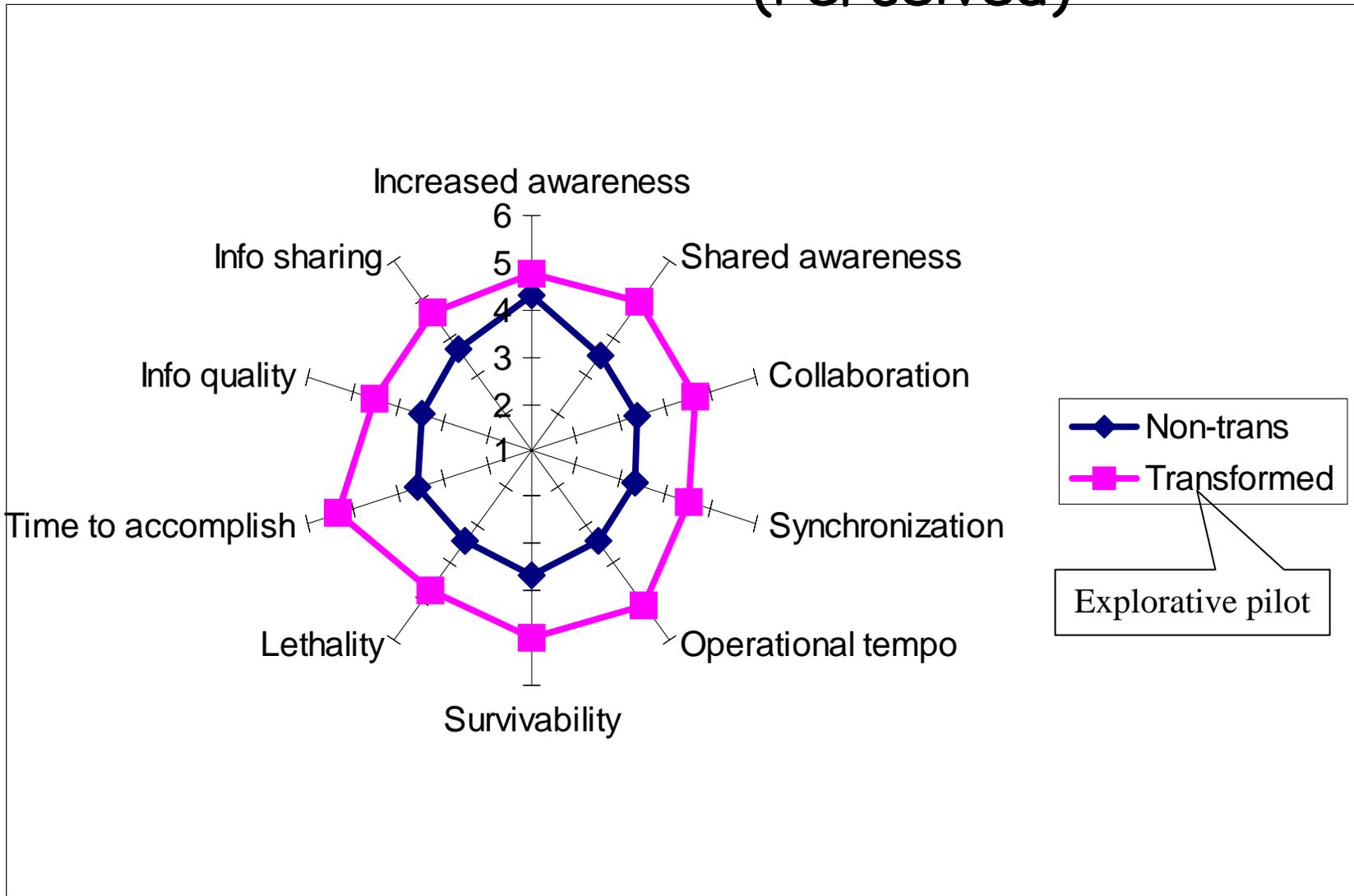


Measuring Effectiveness (Perceived)





Measuring Effectiveness (Perceived)



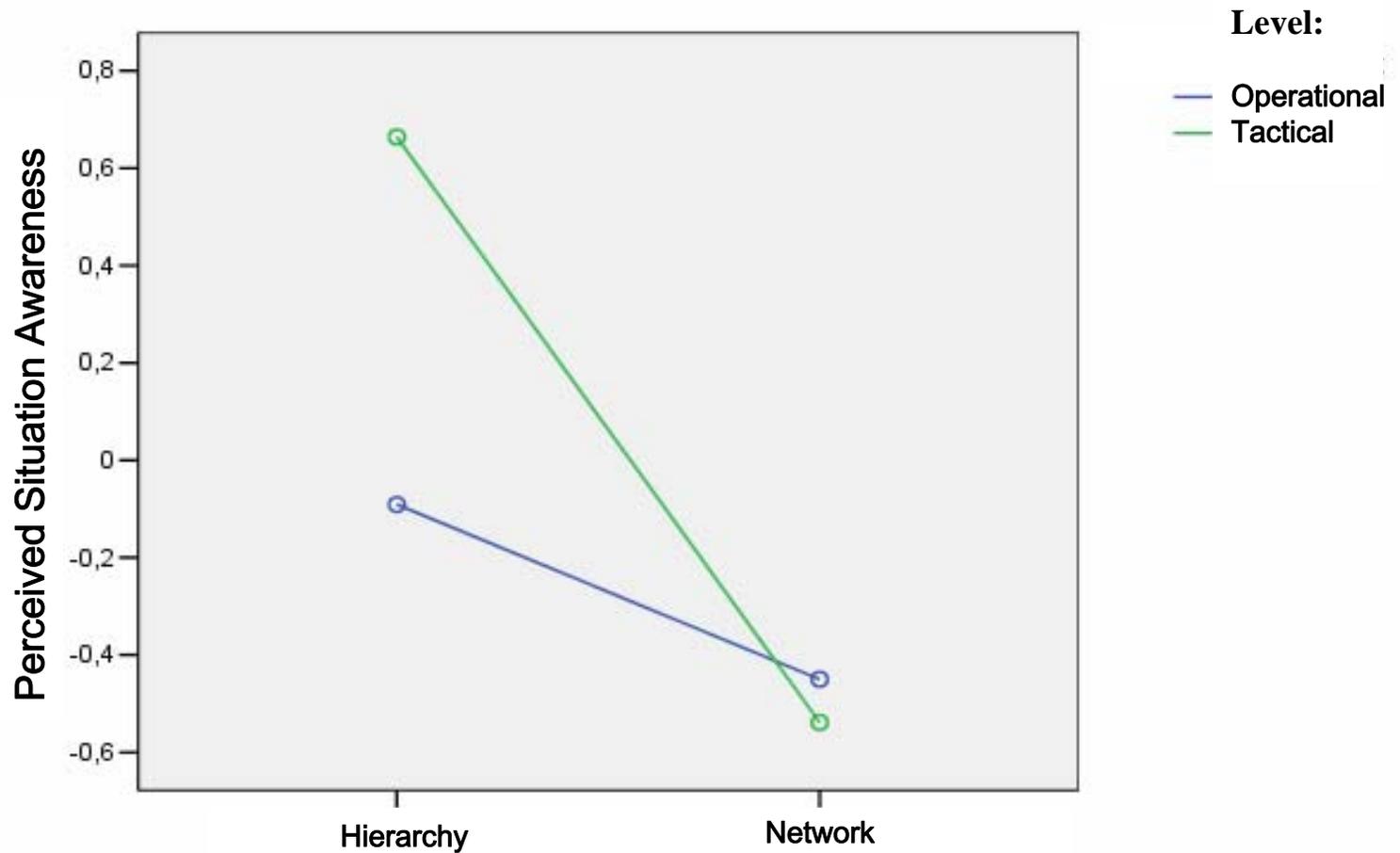


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Experimental Results 2005 - Jun 2006

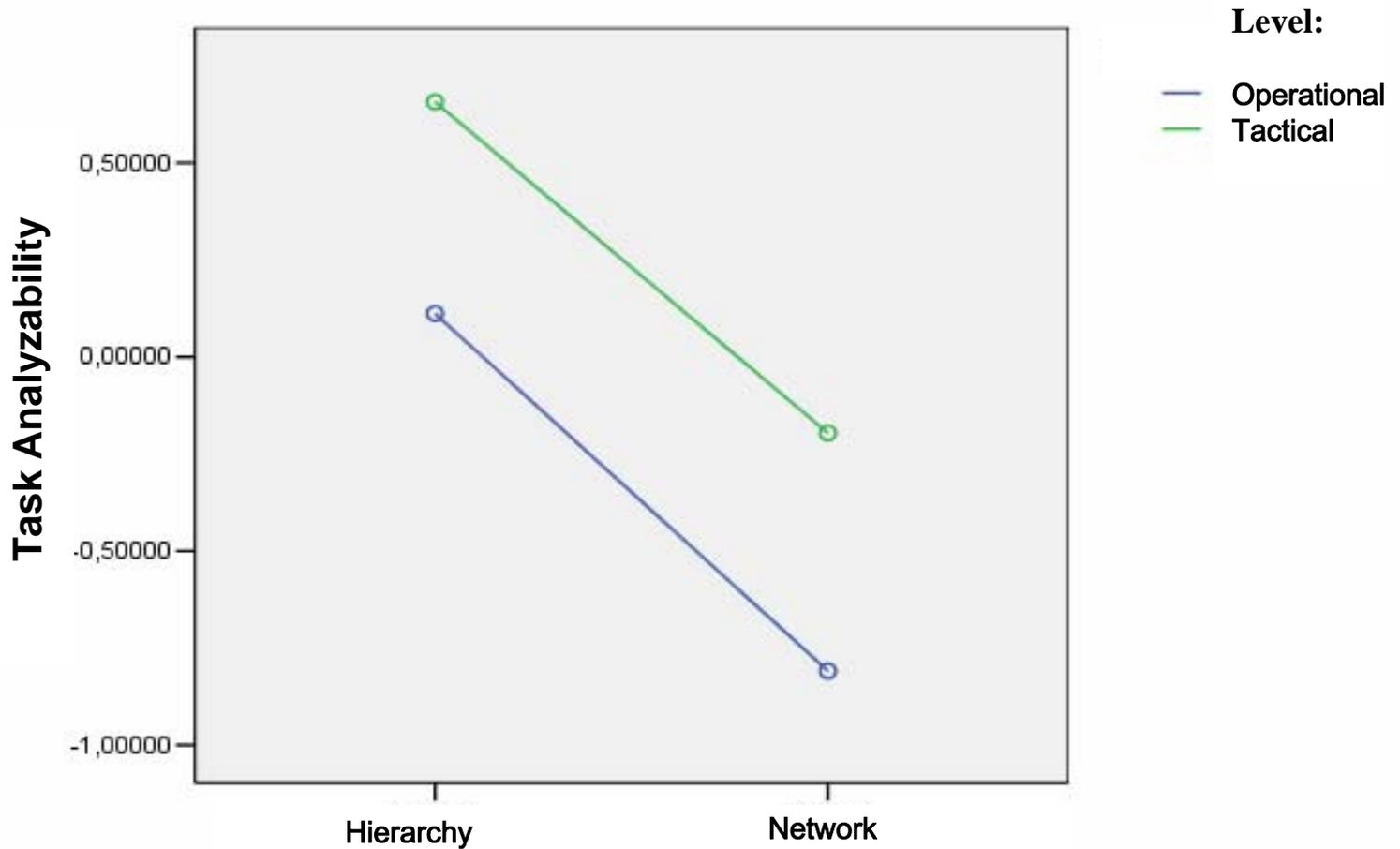


Perceived Situational Awareness



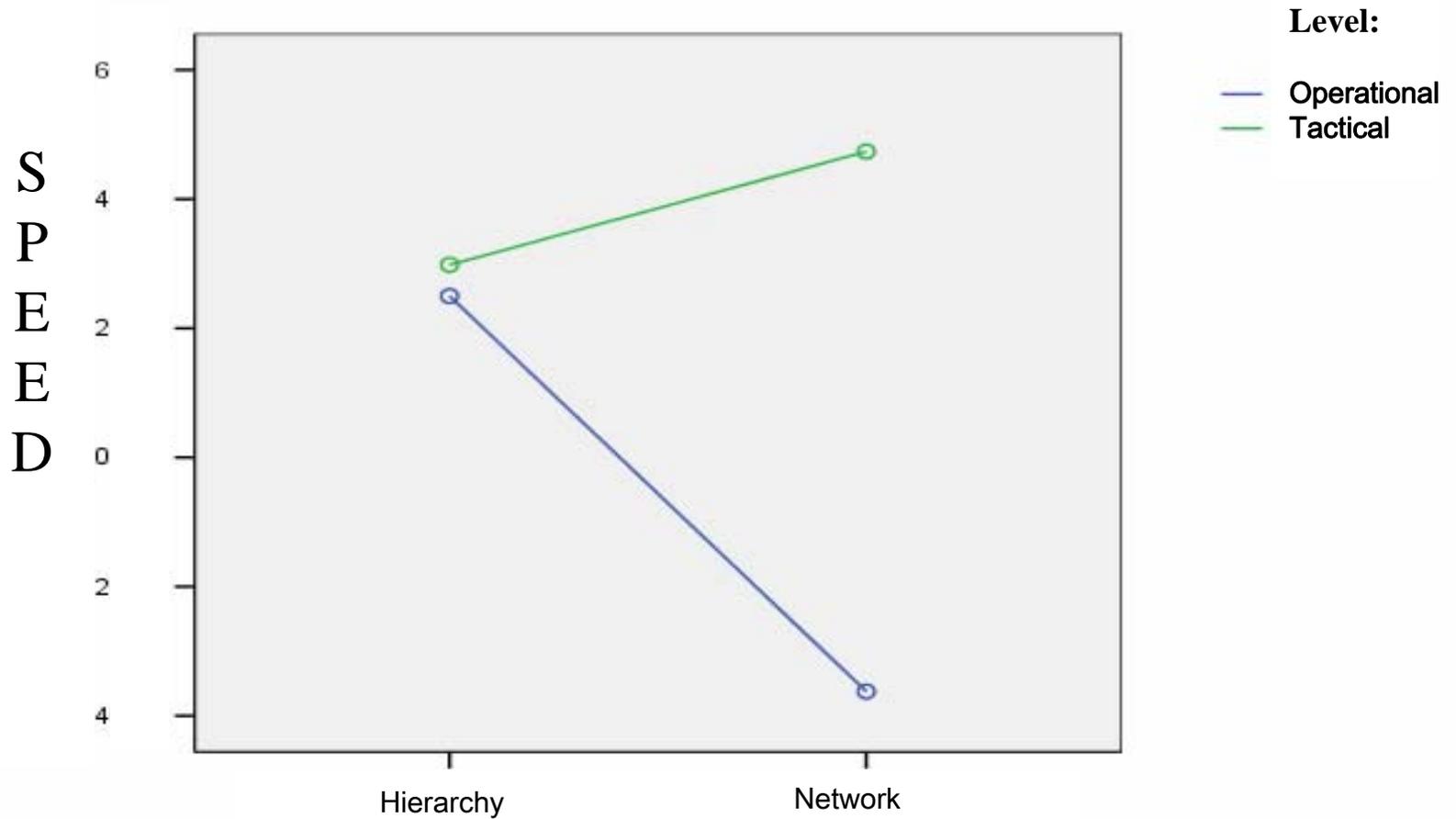


Perceived Task Analyzability



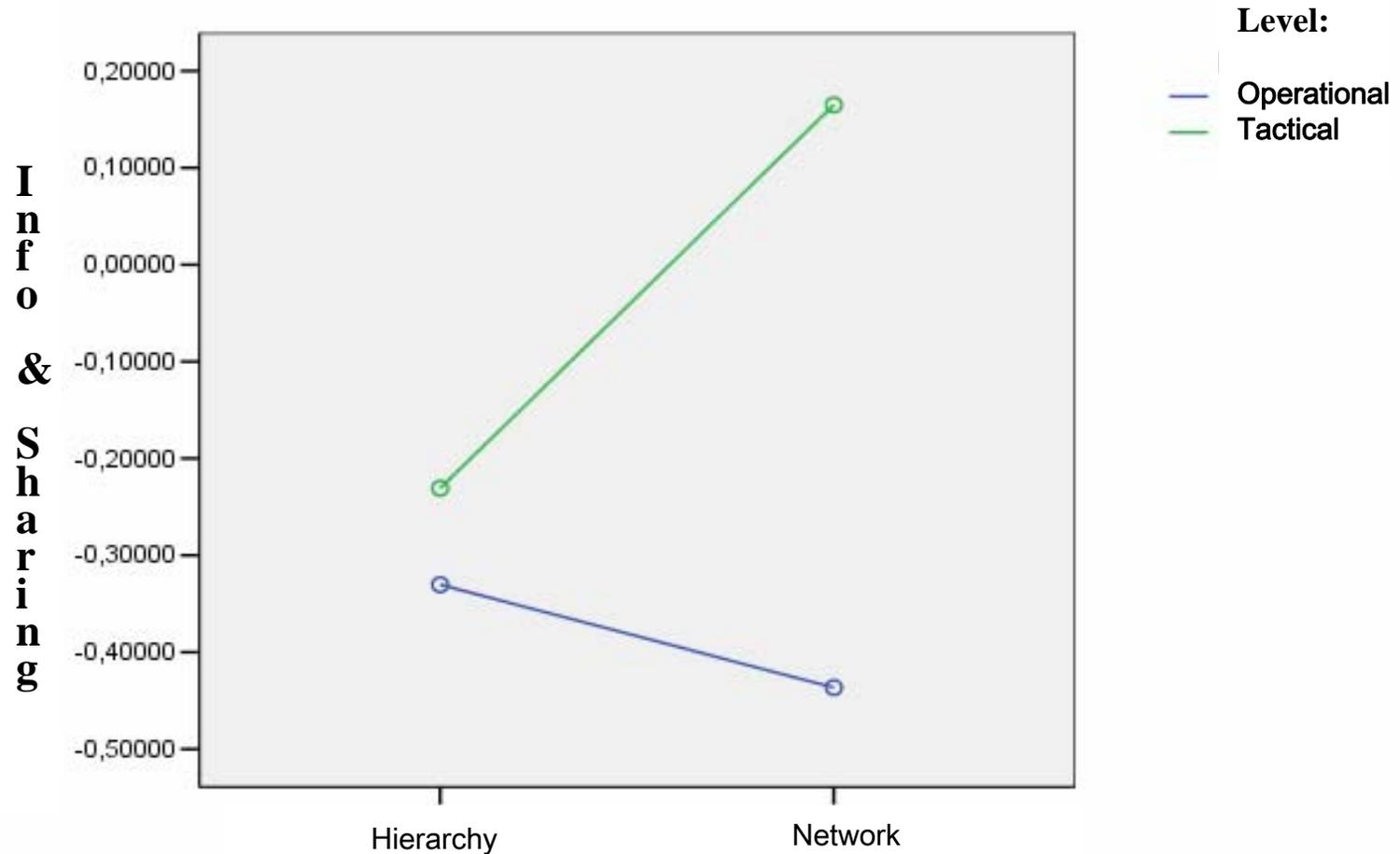


Perceived Speed in Operations



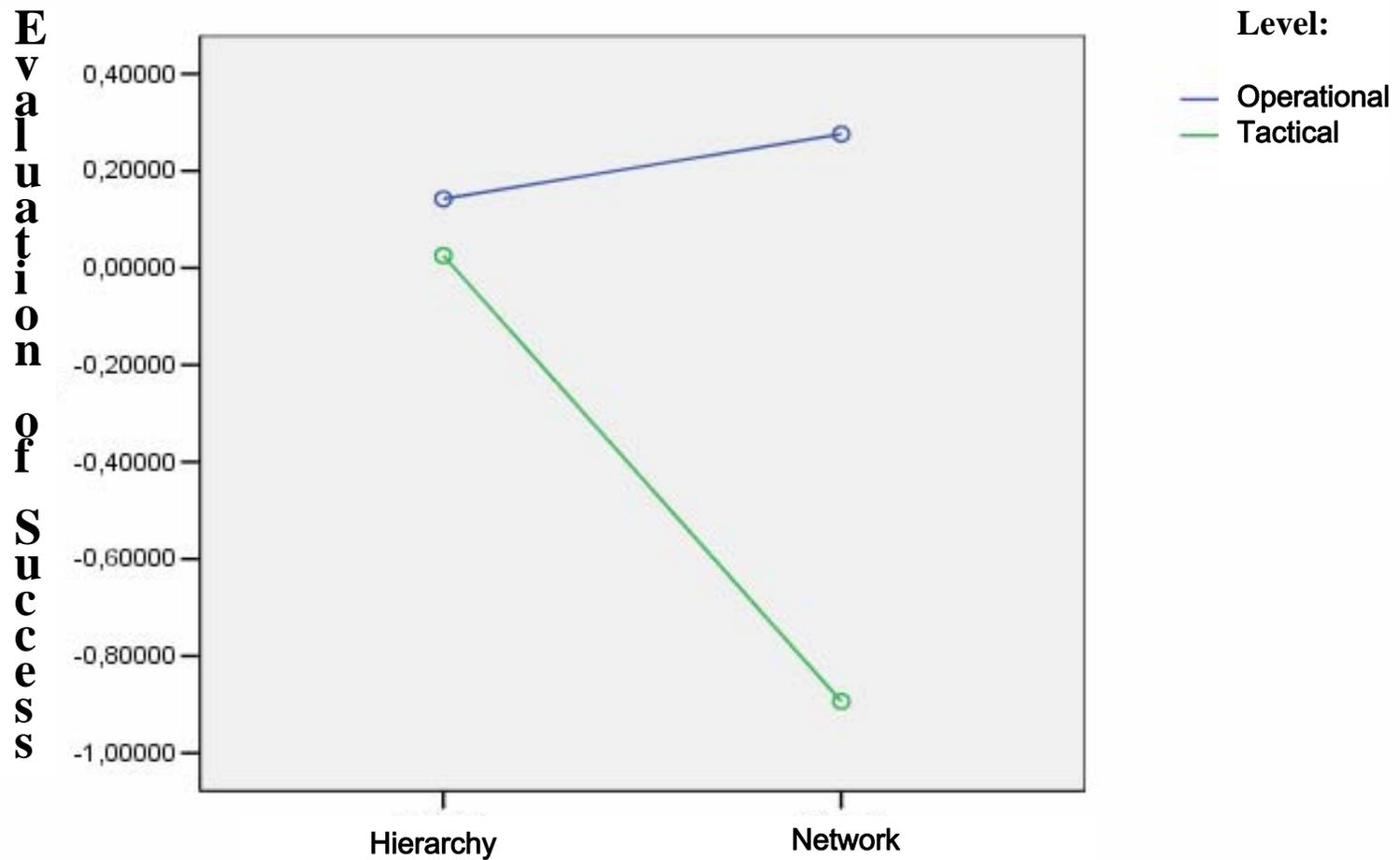


Perceived Quality of Information & Info Sharing





Perceived Success in the Operation





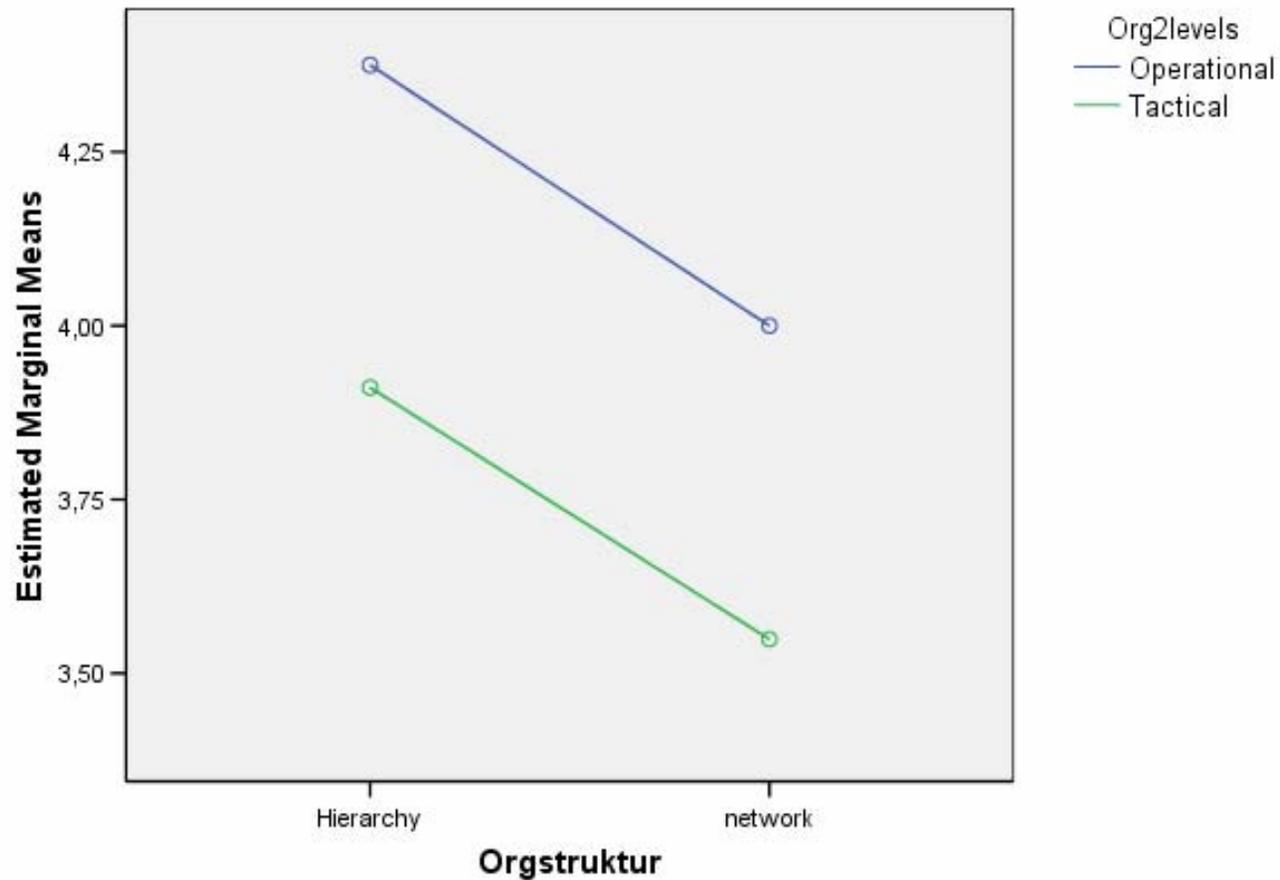
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Experimental Results Sep 2006



Perceived Situational Awareness

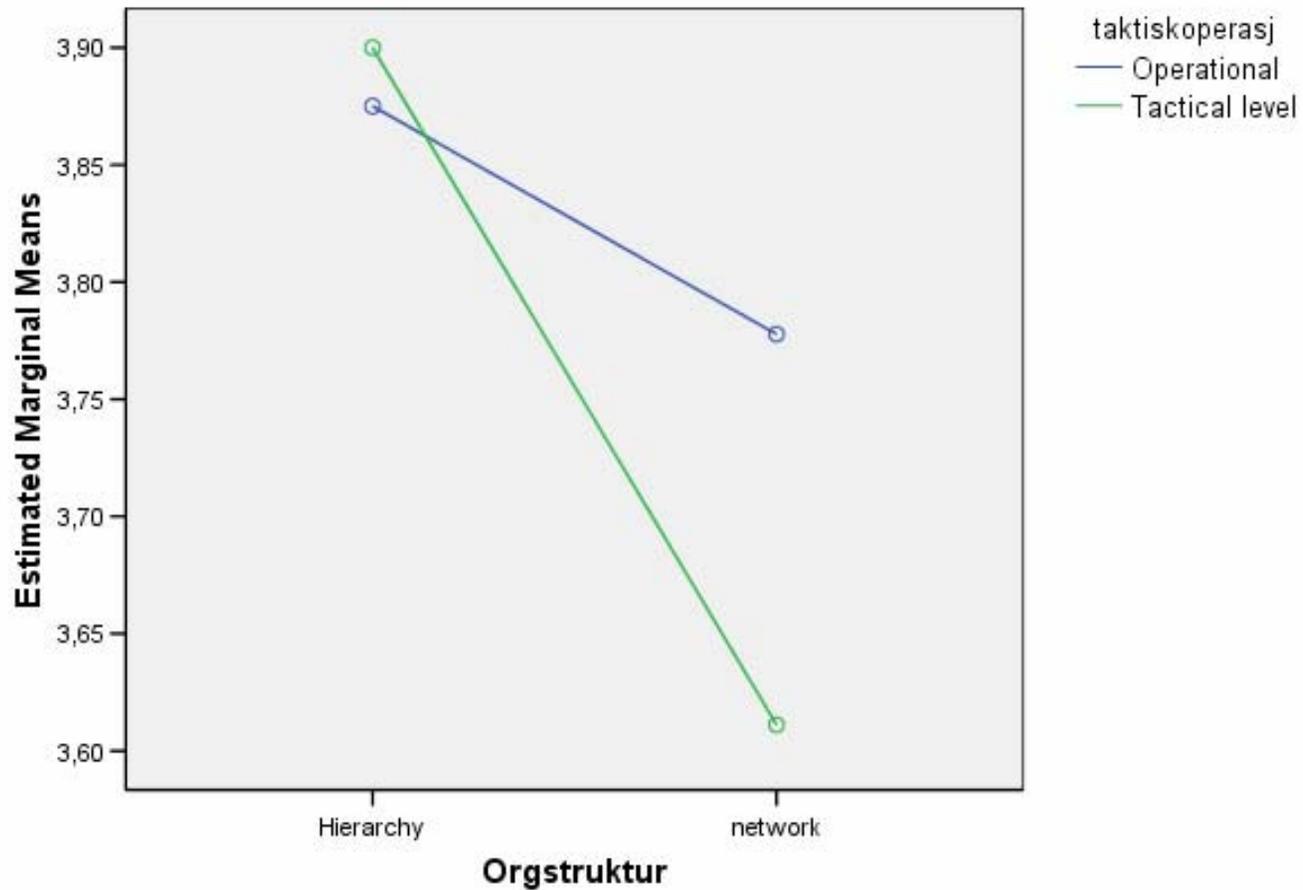
Estimated Marginal Means of NyMeanPercSA





Perceived Success

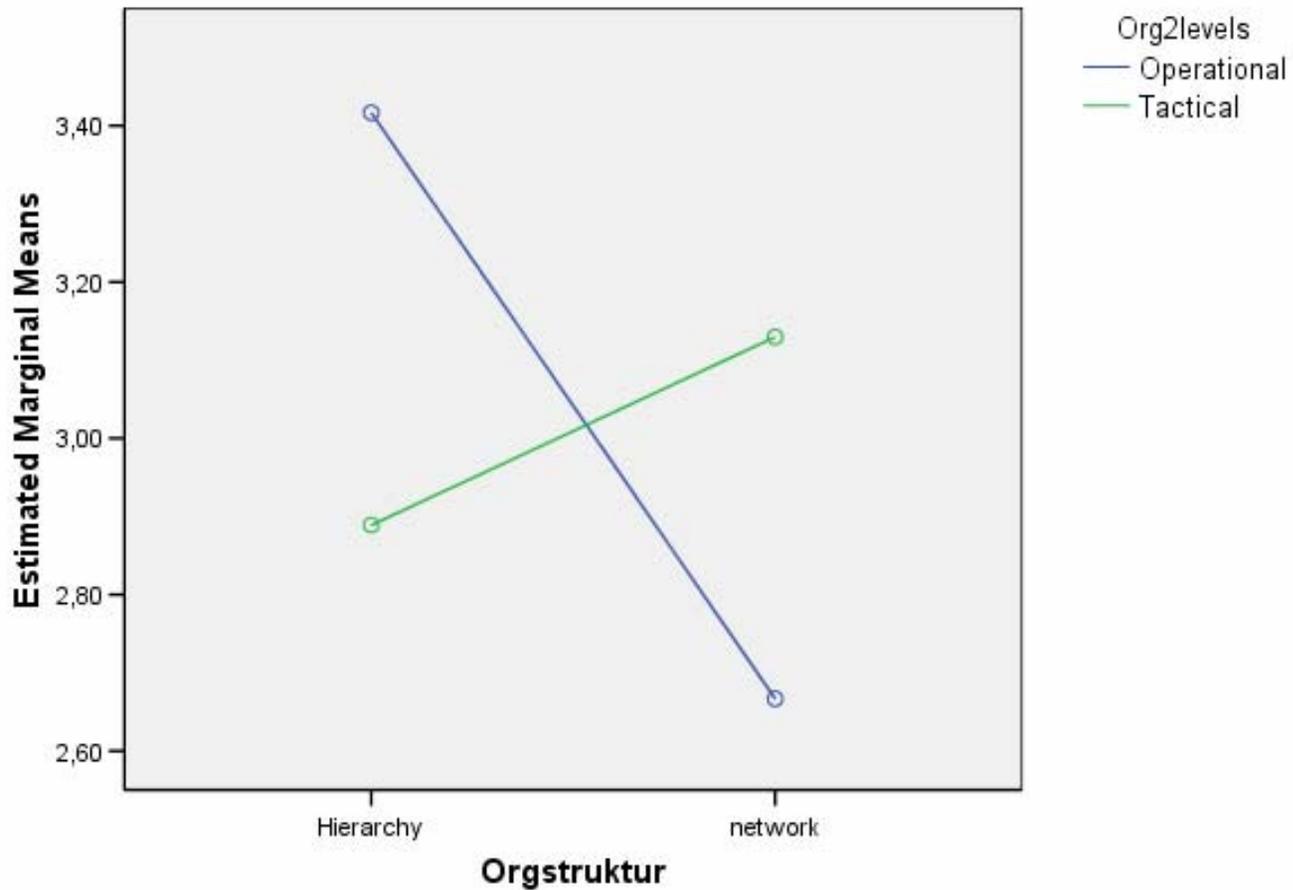
Estimated Marginal Means of PerceivedSuccess





Perceived Information Sharing

Estimated Marginal Means of Infosharing





Discussion

- ❑ Hierarchical organisation implies buffering of information, and delegation of tasks, thus shielding the decision maker from the full complexities of the situation
- ❑ Net-centric organisation, on the other hand, places heavy demands on decision makers in the command systems:
 - ❑ Information processing
 - ❑ Co-ordination of actions
 - ❑ Education and training
- ❑ This is consistent with basic theories on information processing in organisations



Concluding Remarks

- ❑ Net-centric command structures have been promoted as “the” organizational solution to meet the challenges from increasingly complex military operations.
- ❑ Our results indicate that the perception of success and effectiveness of the operations was significantly different between the operational and tactical level, as the structure shifted from a hierarchical structure to a network structure.
- ❑ A main impression from this set of experiments is that many aspects of human interaction have to be managed before a network centric structure may give a full range of benefits in operations.



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