Combining Social Network Analysis with the NATO Approach Space

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The NATO Approach Space
Interesting Legacy

Phase Spaces
(e.g. William Gibbs, 1901)

Functional Holography
(e.g. Baruchi et al., 2004)

Contingency Theory
(e.g. Pugh et al., 1968)

Military Theory
(e.g. NATO, 2007)
Premise

Number of Model Dimensions…

Additional Contribution to Model…
Premise

Number of Model Dimensions…

1 dimension… 3 dimensions…  ...all dimensions

Additional Contribution to Model…
NATO Model Aspirations
“We are interested in the actual place or region in this space where an organisation operates, not where they think they are or where they formally place themselves” (Alberts & Hayes, 2006 p. 75)
“An organisation’s location in the C2 Approach space usually ranges across both function and time” (Alberts & Hayes, 2006 p. 76)
“Identifying the crucial elements of the problem space and matching regions in this space to regions in the C2 Approach is a high priority”

(Alberts & Hayes, 2006 p. 80)
From Typology to Taxonomy
CENTRALITY (SOCIOMETRIC STATUS):

Unitary decision rights = FEW nodes equal to or greater than mean centrality

Peer-to-peer decision rights = MANY nodes equal to or greater than mean centrality
Centrality
Approach Space

DIAMETER:
Hierarchical interaction = LARGER diameter
Distributed interaction = SMALLER diameter
Diameter
Approach Space

DENSITY:
Tight control of information = LESS dense
Broad dissemination of information = MORE dense
Density
Taxonomy

Diameter = \( \max_{u, v} d(u, v) \)

Network Density = \( \frac{2l}{n(n-1)} \)

Sociometric status = \( \frac{1}{g-1} \sum_{j=1}^{g} (\chi_{ji} + \chi_{ij}) \)
Actual Place of Region...

Real Network Raw Data
Function and Time…

- By time…
- By function…
- By organization…
Testing with Network Archetypes
Hypothesis #1: Peer-to-peer networks should be located in top corner
Hypothesis #2:
Hierarchical networks should occupy bottom left hand corner
Effect of Scale
Testing with Live Data
Field Trial

- Field trial involving Brigade and Battle groups
- 73 agents
- Digital comms. (2866 comms. events/34 social networks)
- Voice comms. (158 comms. events/32 social networks)
Field Trial

Raw Data (Telemetry/Observation)

Social Networks (WESTT Software)

Metrics/Coordinates (WESTT Software)

Approach Space
Digital Comms. Layer

The diagram illustrates a 3D space with axes labeled 'Allocation of Decision Rights' and 'Distribution of Information'. The 'Patterns of Interaction' axis is vertical. The diagram highlights the 'Centre of Gravity' and 'Agility' with arrows pointing to specific areas within the space.
Voice Comms. Layer

![Diagram showing patterns of interaction, allocation of decision rights, and distribution of information with a center of gravity and agility dimensions.](image-url)
Agility
Conclusions
Conclusions

- Key innovation is turning NATO RTO SAS-050 approach space from a typology into a taxonomy
- Deriving something that can be expeditiously applied in live settings
- Meeting identified NATO research priorities…
Where C2 ‘actually is’…

![Diagram showing Live-NEC, Edge, and Classic C2 in a 3D space with axes for Allocation of Decision Rights, Distribution of Information, and Patterns of Interaction.]

- **Live-NEC**
- **Edge**
- **Classic C2**
How C2 changes…
Matching areas in approach space to...

- Indian Terror Organizations
- Live-NEC
- Edge
- Classic C2

9/11 Terrorists:
- Ibrahim Abdul
- Waleed al-Shehri
- Waleed al-Shehri
- Jalal Badawi
- Fadhl al-Gosaibi

Indian Terrorists:
- Kamal Hafiz Ahmad
- Mistry
- Almsa
- Aitzaz Hameed
- Malik

Patterns of Interaction
- Allocation of Rights
- Distribution of Information
“Technology is creating new opportunities for different types of command and control, and new types of command and control are creating new aspirations for technology. The question is how to manage this process, how to achieve a jointly optimised blend of socio and technical and create the kind of agility and self-synchronization that modern forms of command and control promise. One answer is to re-visit the considerable legacy of sociotechnical systems theory. In doing so the problems of 21st century command and control are approached from an alternative, multi-disciplinary, and above all human-centred perspective.”

“Time and again, what emerges is a realisation that the most agile, self-synchronising component of all in NEC is the human.”