

Socio-technical interoperability in multi-agency operations



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Interoperability



- Promises a number of significant improvements
- Is necessary for network centric warfare
- Currently tackled through standardization, though this is problematical
 - Slow to agree standards
 - Long procurement cycles and legacy issues
 - Long-term improvements, but no rapid solutions to new situations
 - Not applicable to non-coalition / civilian agencies

Introduction



- Review of factors affecting interoperability
- Focus on achieving pragmatic levels of interoperability between 'irregular' collaborators
- Will argue that:
 - Desired level of interoperability should relate to the requirements of the situation;
 - Interoperability requires a socio-technical approach;
 - An effects-based approach would result in more efficient solutions

Existing interoperability frameworks*



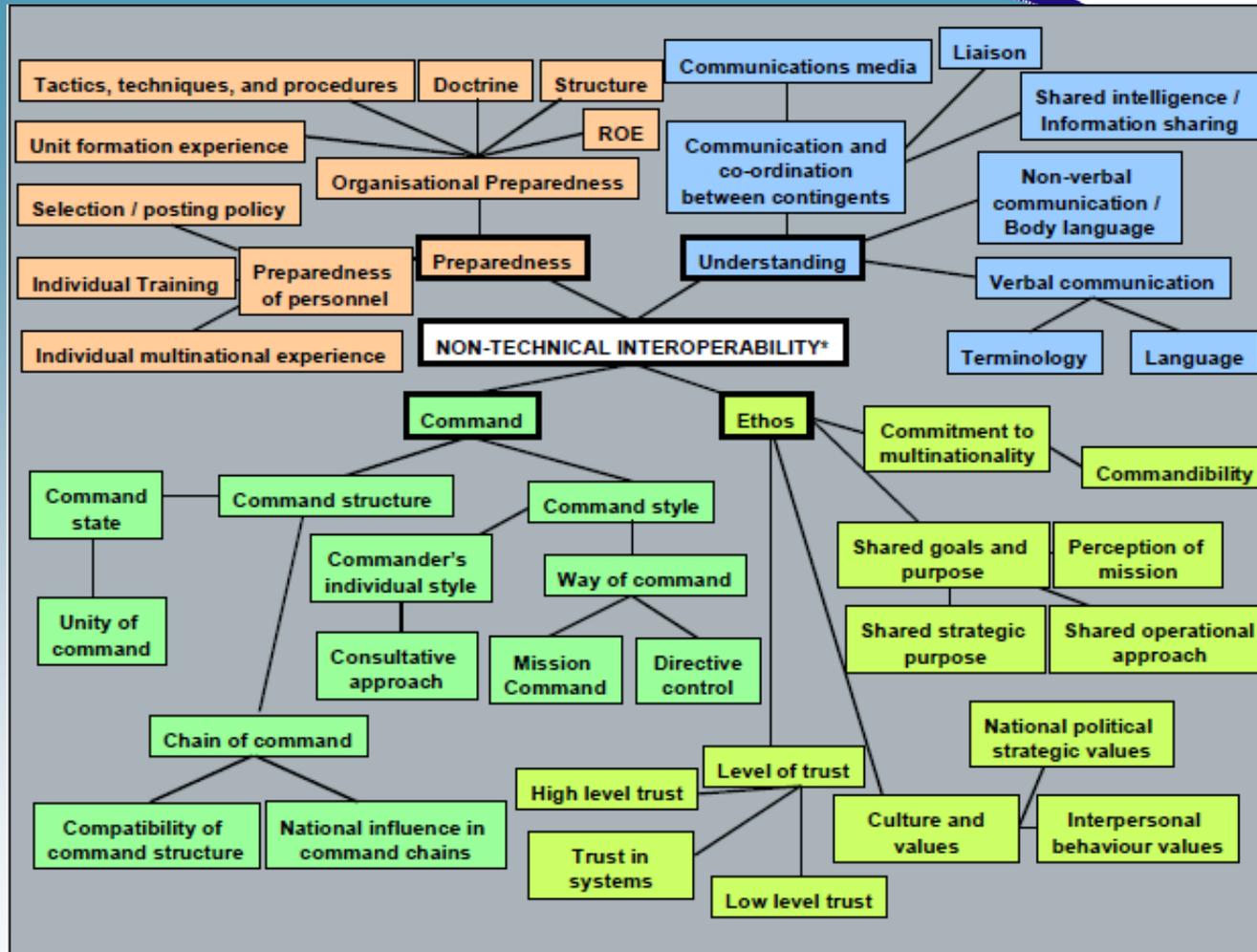
Increasing interoperability ↑

LEVEL (environment)			Interoperability attributes			
			Procedures	Applications	Infrastructure	Data
<i>Enterprise</i> (universal)	4	c	Multi-national	Interactive	Multi-dimensional topologies	Cross-enterprise models
		b	Intra-government			
		a	Defence department			
<i>Domain</i> (integrated)	3	c	Domain	Shared data	WAN	DBMS
		b		Grp collaboration		Domain models
		a		Txt cut & paste		
<i>Functional</i> (distributed)	2	c	Common Operating Environment	Web browser	LAN	Program models & advanced data formats
		b		Office software		
		a		Program		
<i>Connected</i> (peer-to-peer)	1	d	Standards compliant	Basic messaging	Two way	Basic data formats
		c		Data file transfer		
		b	Security profile	Simple interaction	One way	
		a				
<i>Isolated</i> (manual)	0	d	Media exchange procedures	<i>Not applicable</i>	Removable media	Media formats
		c	Personnel access controls		Manual re-entry	Private data
		b				
		a				
		0				

US DoD LISI model (Clark and Moon, 2001)

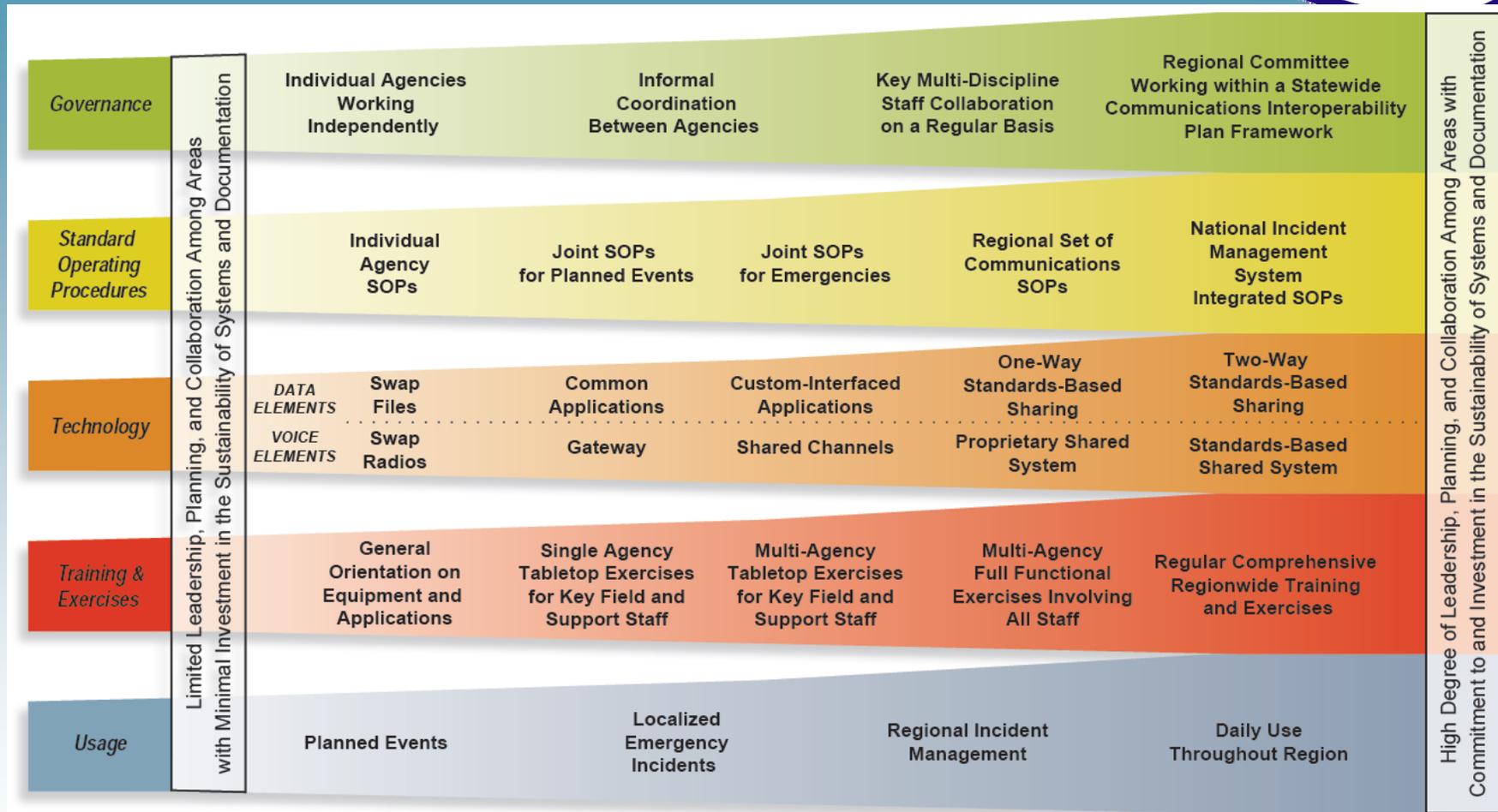
* see Ford, T. C., Colombi, J. M., Graham, S. R. and Jacques, D. R. (2007) A survey on interoperability measurement, *12th International Command and Control Research and Technology Symposium: Adapting C2 to the 21st Century*, Newport, RI, 19-21 June 2007.

Existing interoperability frameworks (2)



Framework for non-technical interoperability
(Stewart et al., 2004)

Existing interoperability frameworks (3)



Interoperability continuum
(Department for Homeland Security)

Existing interoperability frameworks (4)



- Show that the problem relates to both social and technical components of organisation; no clear boundary between the two
- Some unresolved issues:
 - Complexity and time to complete
 - Long-term improvements over short-term practical measures
 - ‘More is better’ assumption
 - Interoperability is merely a means to an end

Interoperability dimensions



Equipment	Logistics	Information	Operational	Organisation	Culture
<ul style="list-style-type: none"> • Comms networks • Hardware platforms • Protocols • Compatibility of mission planning • Security of communications • Combat ID • Procurement lifecycle 	<ul style="list-style-type: none"> • Food • Medical care • Munitions • Maintenance and repair • Transport • Facilities 	<ul style="list-style-type: none"> • Level of communication • Use of information • Information security and sharing / access • Language • Standardized terminology • Style of communication • Interpretation of information • Shared awareness • Expectations 	<ul style="list-style-type: none"> • Goals and priorities • Planning and decision-making processes • Commander's style • Type of mission • Size and complexity of force • Tempo • Synchronisation • Roles and responsibilities • Mission 'buy in' 	<ul style="list-style-type: none"> • Culture, structures and pace of change • Level of operation • Budget / funding constraints • Training • Doctrine • Time to make decisions • Liaison staff • Legal considerations • Autonomy • Aggression / risk taking • Trust 	<ul style="list-style-type: none"> • Beliefs & norms governing behaviour • Values • National interests • Media interest • Equity of risk and reward

ments



Interoperability is a complex socio-technical issue

Dimensions may act either as barriers or enablers of interoperability and are interdependent

No single category or dimension is sufficient to ensure interoperability

Different levels of difficulty associated with altering dimensions

Interdependence may lead to workarounds

Example #1: Grenadier Guards and ANA



Operation by UK and ANA forces against the Taliban
in 2007

Equipment: almost no technical interoperability

Logistics: some shared facilities

Information: language, restricted awareness of battle-space

Operational: under close supervision, limited support role

Organization: training and experience, aggression, trust

Culture: Different cultural norms, risk perception?

Low but workable level of interoperability, enabling

Example #2: UK emergency services



Coordination of 'category 1' responders during major incidents

Equipment: broadly compatible radios

Logistics: no common vehicle platform

Information: no data sharing ability

Operational: common goals, but different priorities and tactics

Organization: different structures and areas of operations

Culture: similar broad national values and interests

Difficult to evaluate, improvements would be costly

Effects-based systems approach



Comprehensive - use of all 6 categories of interoperability

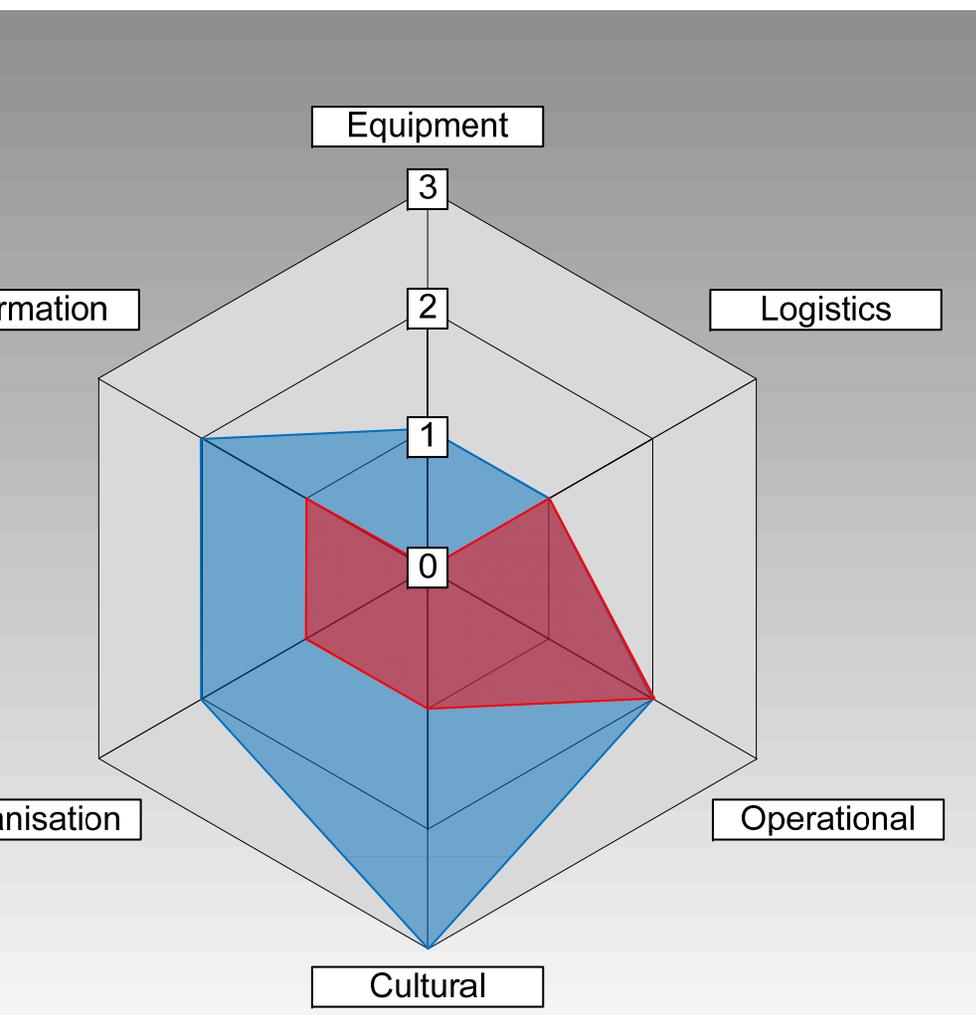
Rapid assessment of each category by referring to the most relevant dimensions

Consideration of two questions:

What is the lowest required level of cooperation (and therefore interoperability) in order to achieve the mission aims?

What is most effective way to achieve the required level of interoperability?

Interoperability assessment



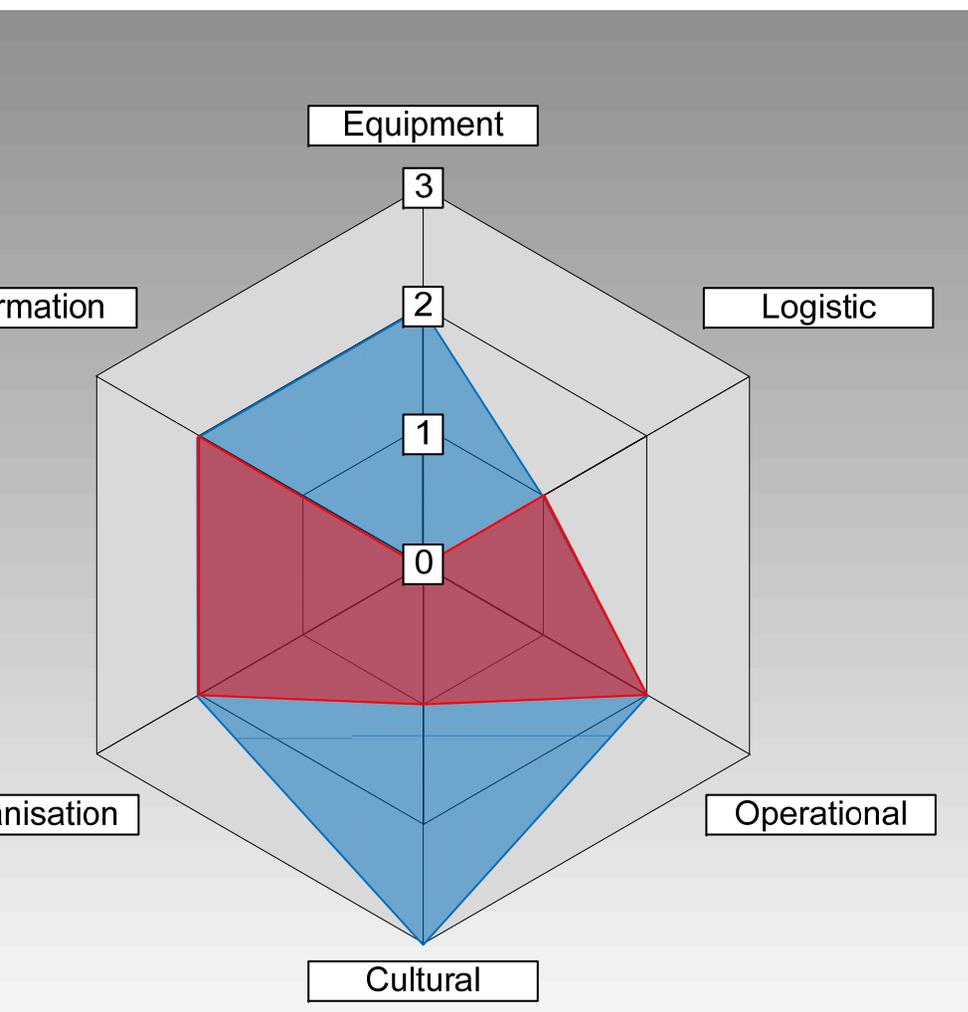
Levels of interoperability

- 3 High
- 2 Medium
- 1 Low
- 0 Non interoperable

Examples

-  UK emergency services
-  ANA / Grenadier Guards

Minimal levels of interoperability



Levels of interoperability

- 3 High
- 2 Medium
- 1 Low
- 0 Non interoperable

Examples

- UK emergency services
- desired
- ANA / Grenadier Guards
- desired

uation



Intended for rapid use in situations where cooperation is required at short notice

Does not solve problem of interoperability, but does help with identification of workarounds

Provides an achievable goal of interoperability

Impact of level of analysis

Could be developed into an assessment tool

Conclusion



Raises questions about the focus on standardization

Interoperability is a means to an end

There will always be mismatches between partner organisations and constraints of the situation which will need to be addressed 'on the ground', requiring a pragmatic approach

Effects-based approach should help to identify more appropriate and efficient ways of achieving



Any questions?

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