

# Agility of C2 Approaches and Requisite Maturity in a Comprehensive Approach Context

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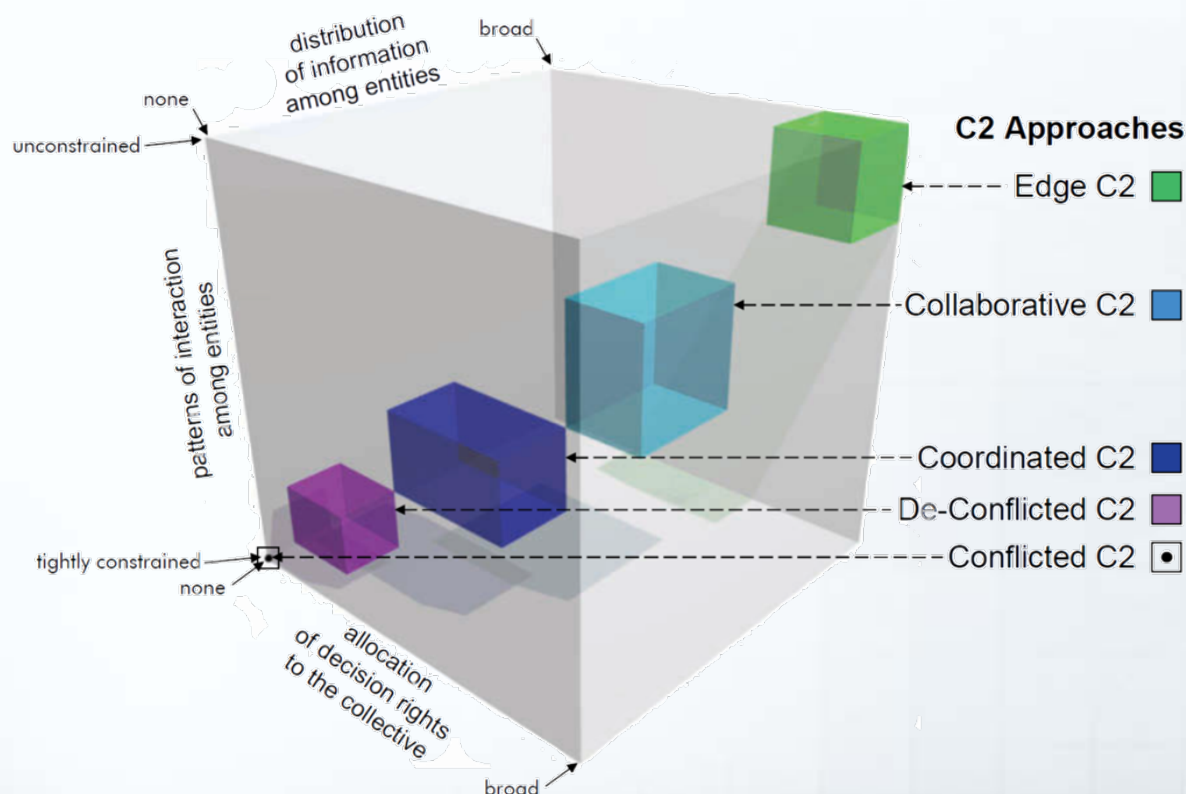


# Outline

- Agility to deal with complex endeavours
- Simulation model of a comprehensive approach
- Experimental plan
- Results
- Discussions
- Conclusion

Agility is the capability to successfully cope with changes in circumstances\*

## C2 Approach space\*

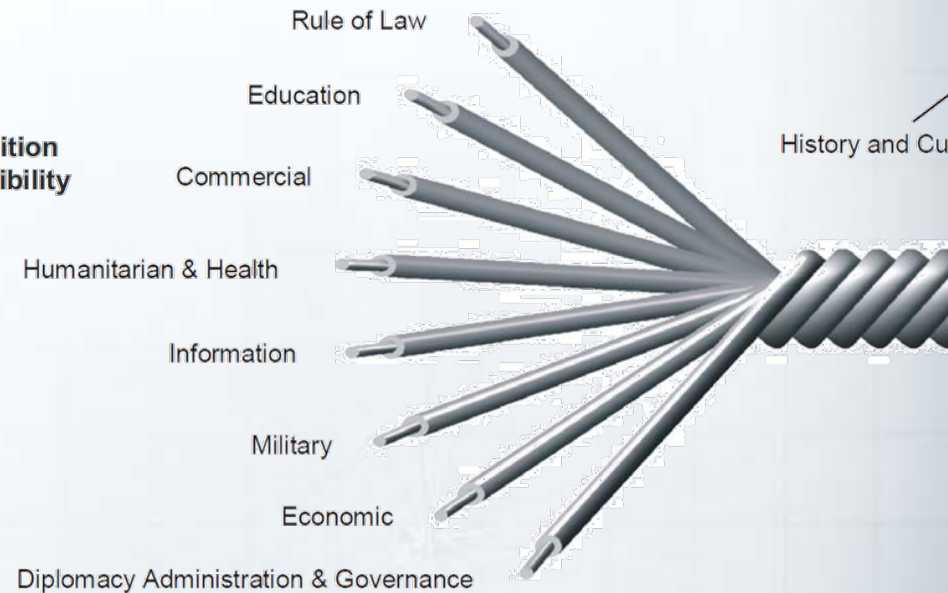
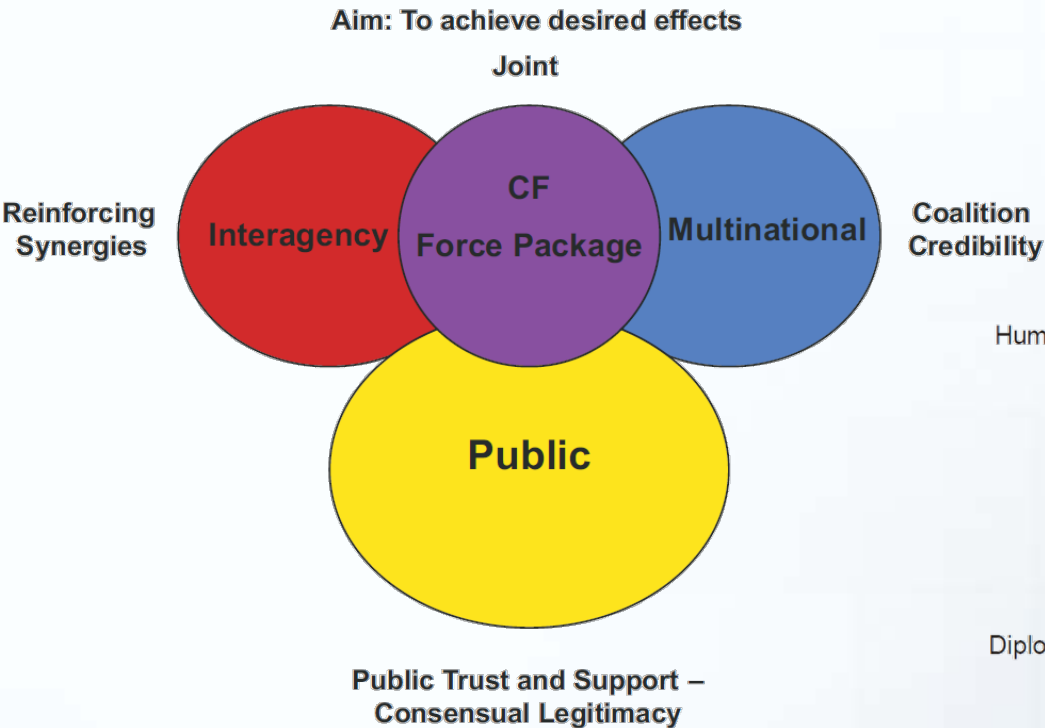


## Enablers of agility

- Responsiveness
- Robustness
- Flexibility
- Resilience
- Adaptability
- Innovativeness

# Comprehensive approach

## Joint Interagency Multinational Public



**Figure 1 – The Constituents of a Society**

Source: Leslie, A., P. Gizewski, and M. Rostek. "Developing a Comprehensive Approach to Canadian Forces Operations." *Military Operations*, 2008.

Source: United Kingdom: Ministry of Defence. (2006). *The Comprehensive Approach*, Joint Discussion Note 4/05.

# IMAGE: Comprehensive approach in a crisis context

- The simulation model takes place in the context of a failing state that has experienced years of civil wars and conflicts with a neighboring country
- The country is afflicted by many problems: lack of infrastructure and education, poverty, flood of refugees, diseases, attacks by rebels, unemployment, and corruption
- The international community mobilizes and puts in place a mission involving many organizations that aims at securing and stabilizing the country
- Organizations on the terrain are: joint task force , four OGDs, five NGOs, and the police and the armed forces of the failing state
- This model uses real and freely available data from an existing country
- The model was implemented in IMAGE (Lizotte *et al.*, 2008)

# Deployment of organizations

## International

DWB: Doctor Without Border  
WHO: World Health Organization  
WFP: World Food Program  
Red Cross  
USAID: US Agency Inter. Devel.

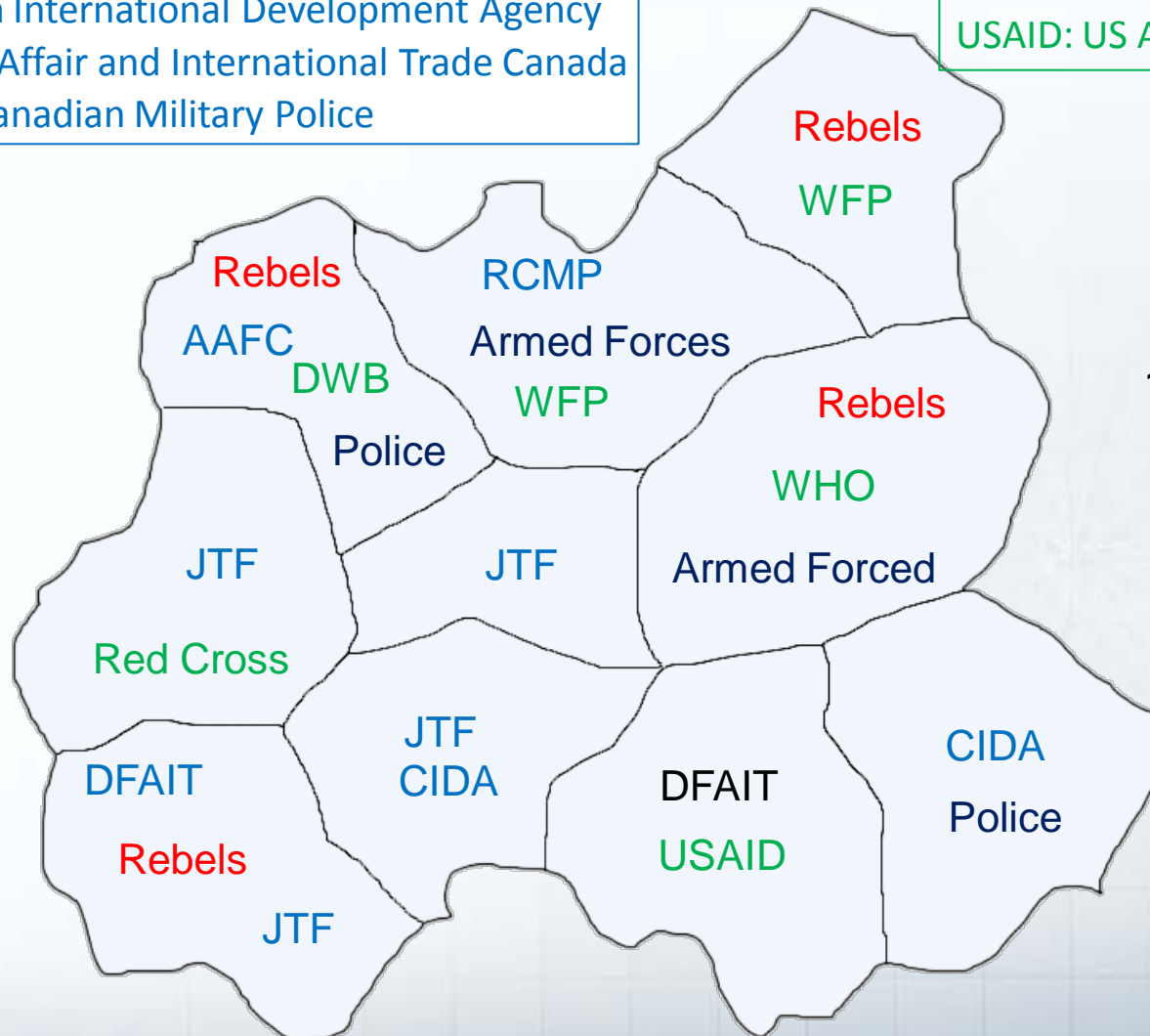
24 units from  
13 organizations  
are deployed in  
10 provinces

## Local

Armed forces  
Police

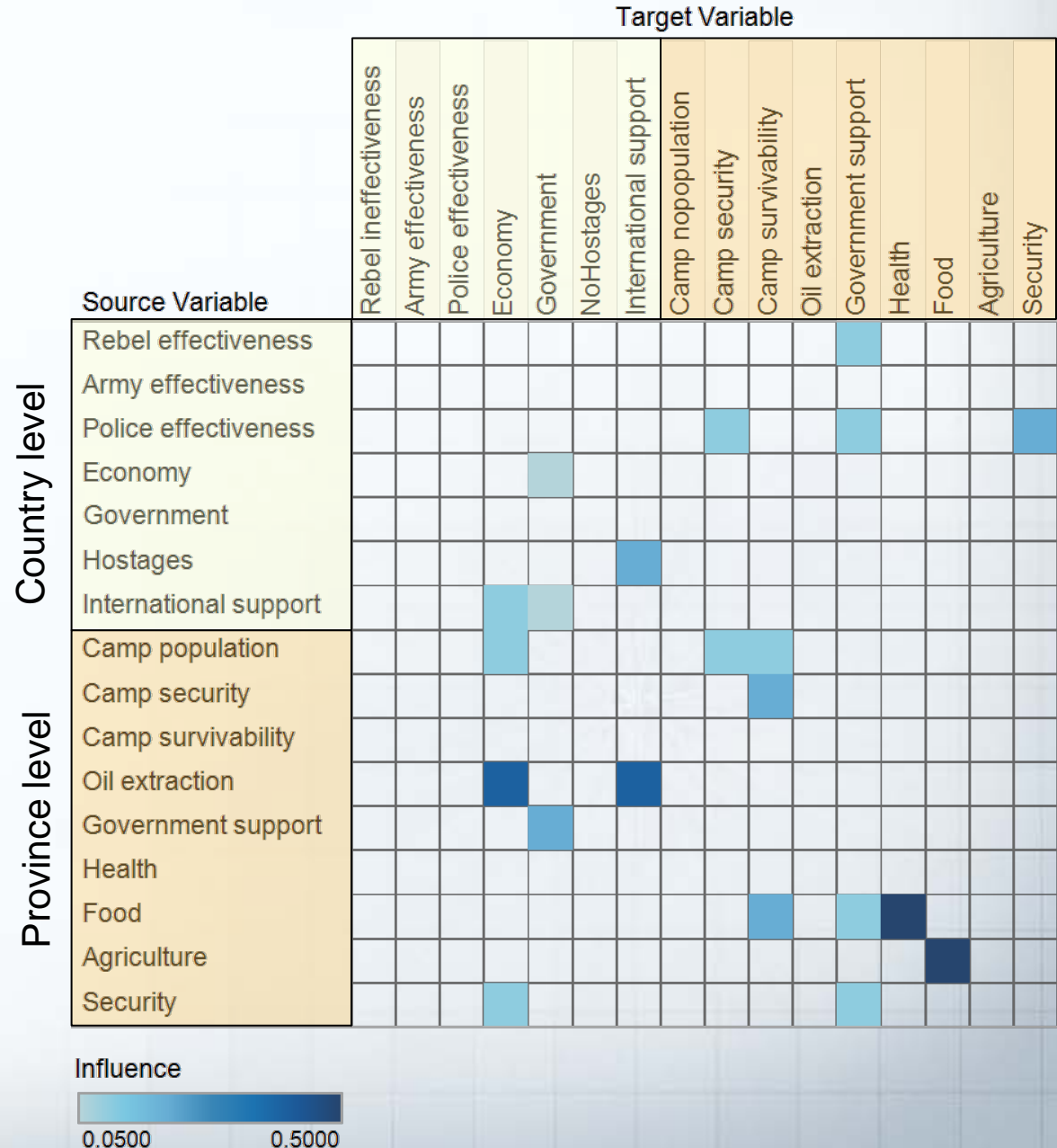
## Canadian

JTF: Joint Task Force  
AAFC: Agriculture Canada  
CIDA: Canadian International Development Agency  
DFAIT: Foreign Affairs and International Trade Canada  
RCMP: Royal Canadian Mounted Police



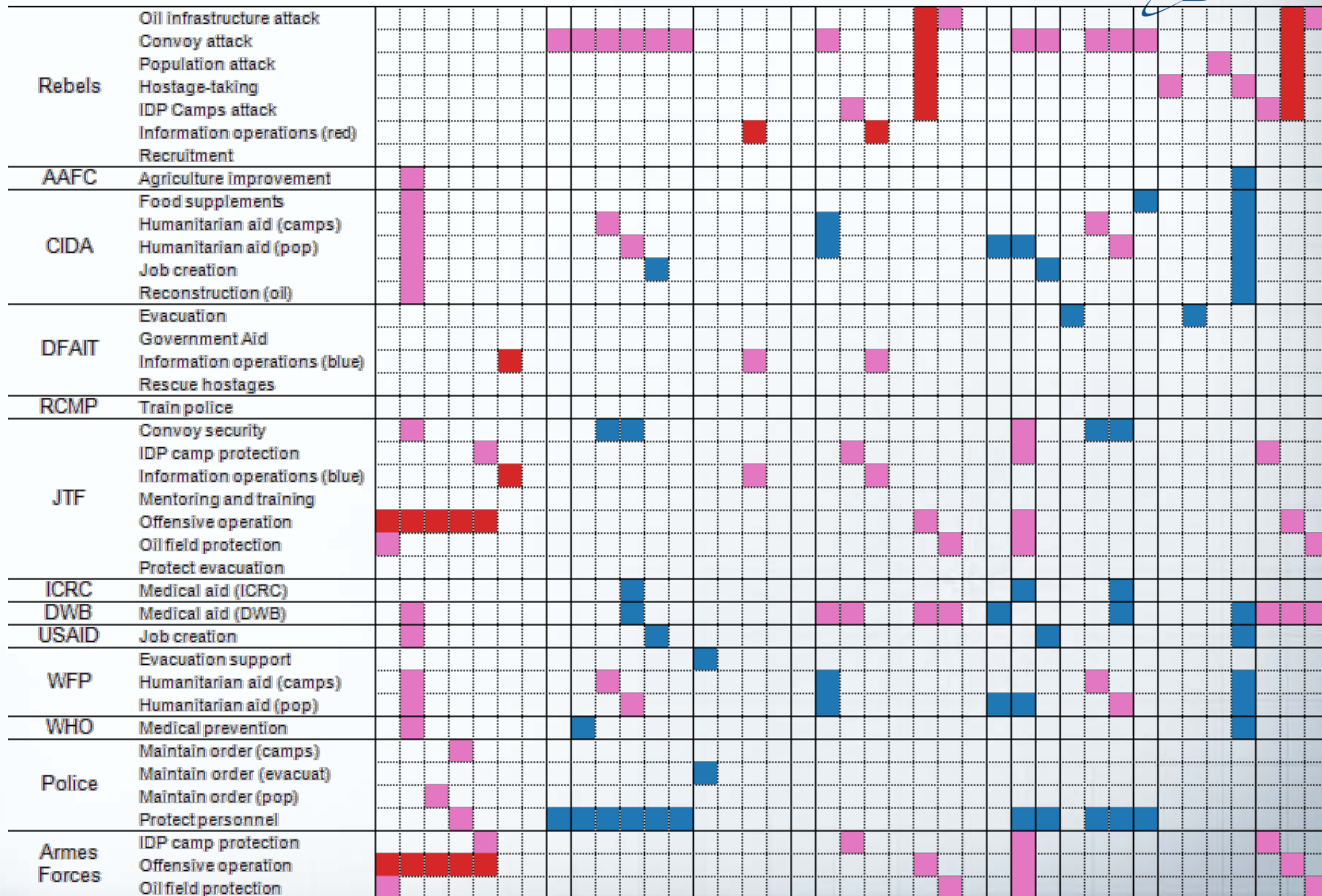
# Important variables and complexity

- Based on the cross-impact method
- A few variables capture important aspects related to the crisis
- These variables influence each others



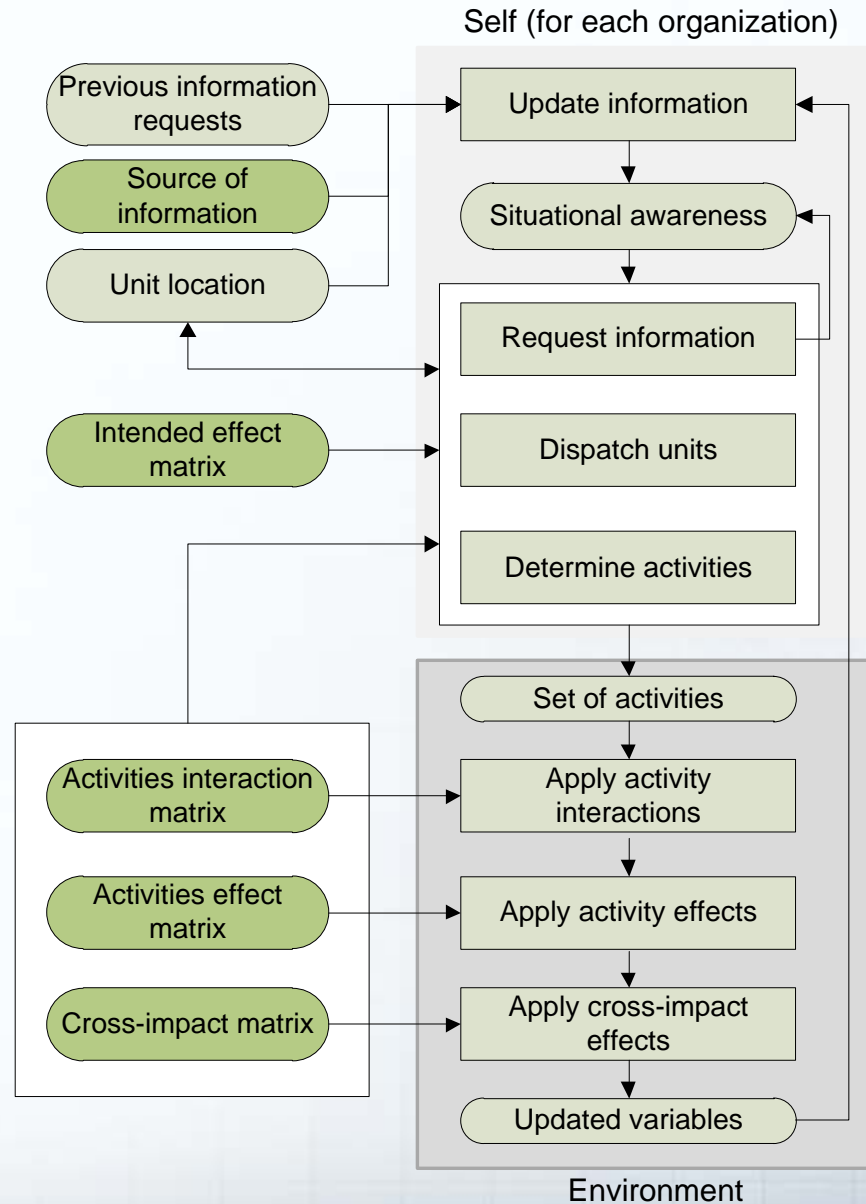


# Interaction between activities





# Simulation process



# C2 approach space

C2 Approach	Distribution of information among entities	Allocation of decision rights to the collective	Pattern of interaction among entities	Organization planning process
Conflicted	Between units of the same organization.	Each organization decides on its unit locations and activities.	Between units of the same organization.	Move unit(s) to most problematic province(s) and then select the activity for each unmoved unit that impacts the variable with the lowest value.
De-conflicted	Variables shared instantly between organizations having collocated units.	Each organization decides on its unit locations and non-conflicting activities.	With organizations having collocated units for preventing conflicting activities.	Like in conflicted but conflicting activities are not allowed.
Coordinated	Like in de-conflicted + variables shared with 5 non-collocated units (delay: 5 iter).	Like in de-conflicted but interacting activities are considered first with collocated units.	With organizations having collocated units for considering interacting activities.	Like in conflicted but all possible interactions between activities with collocated units are considered.
Collaborative	Same as coordinated but with any number of units (delay: 3 iter).	All activities and location of units are decided collectively.	With all organizations for deciding location of units and activities.	All combinations of unit locations and activities are considered. Those with the higher impact are retained.
Edge	Organizations have an instant access to the ground truth.	Like in collaborative.	Like in collaborative.	Like in collaborative.

# Experimental plan

H1: More network-enabled C2 approaches provide higher level of agility

H2: Enablers of agility are positively correlated with measures of agility

Factors	Levels			# Conditions
C2 approach	Conflicted, De-conflicted, Coordinated, Collaborative, Edge			5
Change in circumstances	Self	Information sharing delays	Low, Medium, High	54
		Missing organizations	M (2 missing), NM	
	Environment	Enemy strength	Weak, Normal, Powerful	
		Crisis severity	Mild, Moderate, Critical	
Problem complexity	Low (industrial age) and high (information age)			2



540 Conditions

# Results: Measures of mission success

Self



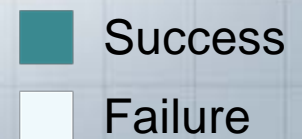
Edge

		Conflicted						De-Conflicted						Coordinated						Collaborative						Edge					
Crisis severity		Low Delays	Avera. Delays	High Delays	Low Delays	Avera. Delays	High Delays	Low Delays	Avera. Delays	High Delays	Low Delays	Avera. Delays	High Delays	Low Delays	Avera. Delays	High Delays	Low Delays	Avera. Delays	High Delays	Low Delays	Avera. Delays	High Delays	Low Delays	Avera. Delays	High Delays	Low Delays	Avera. Delays	High Delays	Low Delays	Avera. Delays	High Delays
		NM	M	NM	M	NM	M	NM	M	NM	M	NM	M	NM	M	NM	M	NM	M	NM	M	NM	M	NM	M	NM	M	NM	M	NM	M
Powerful	Critical																														
	Moderate																														
	Mild																														
Average	Critical																														
	Moderate																														
	Mild																														
Weak	Critical																														
	Moderate																														
	Mild																														



Environment

Legend:



# Results: Requisite maturity

Map of « less network-enabled »  
C2 approach required

Enemy	Crisis ..	Low Delays		Avera. Delays		High Delays	
		NM	M	NM	M	NM	M
Powerful	Critical	Conflicted	Collaborative	Conflicted	Collaborative	Conflicted	Edge
	Moderate	De-Conflicted	Collaborative	De-Conflicted	Collaborative	De-Conflicted	Collaborative
	Mild	De-Conflicted	Collaborative	De-Conflicted	Collaborative	De-Conflicted	Collaborative
Average	Critical	De-Conflicted	Collaborative	De-Conflicted	Conflicted	De-Conflicted	Conflicted
	Moderate	De-Conflicted	Collaborative	De-Conflicted	Collaborative	De-Conflicted	Collaborative
	Mild	De-Conflicted	Coordinated	De-Conflicted	Coordinated	De-Conflicted	Coordinated
Weak	Critical	De-Conflicted	Conflicted	De-Conflicted	Conflicted	De-Conflicted	Conflicted
	Moderate	De-Conflicted	Collaborative	De-Conflicted	Collaborative	De-Conflicted	Collaborative
	Mild	De-Conflicted	De-Conflicted	De-Conflicted	De-Conflicted	De-Conflicted	De-Conflicted

## Requisite Maturity

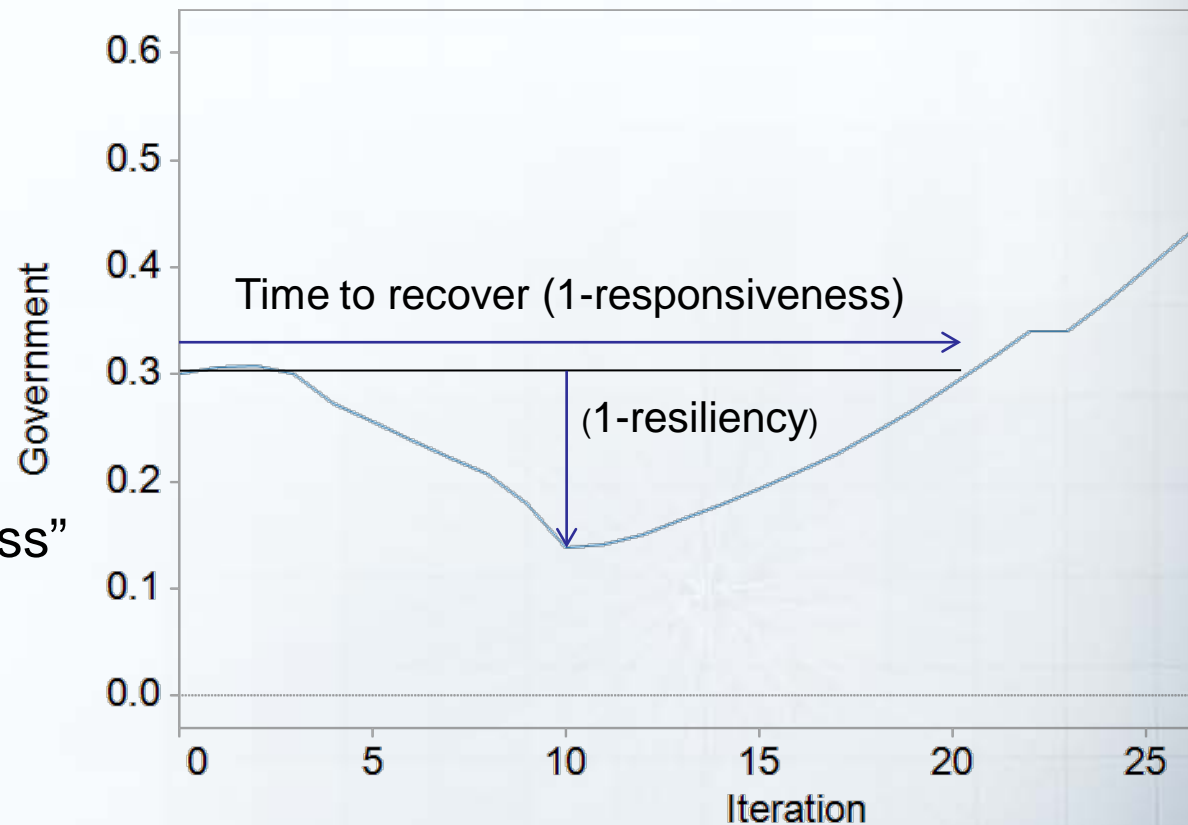
- Conflicted
- De-Conflicted
- Coordinated
- Collaborative
- Edge

Proportion of changes in circumstances  
successfully coped by at least one C2  
approach included in the level

Level	Percentage of changes in circumstances
Level 5	80%
Level 4	80%
Level 3	61%
Level 2	56%
Level 1	37 %

# Enablers of agility\*

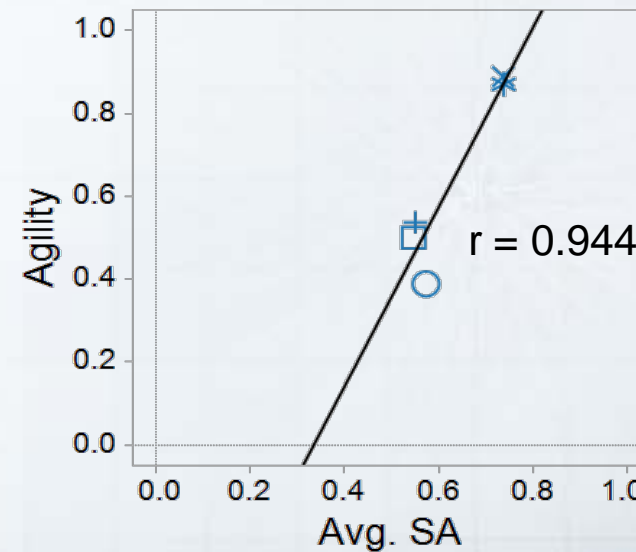
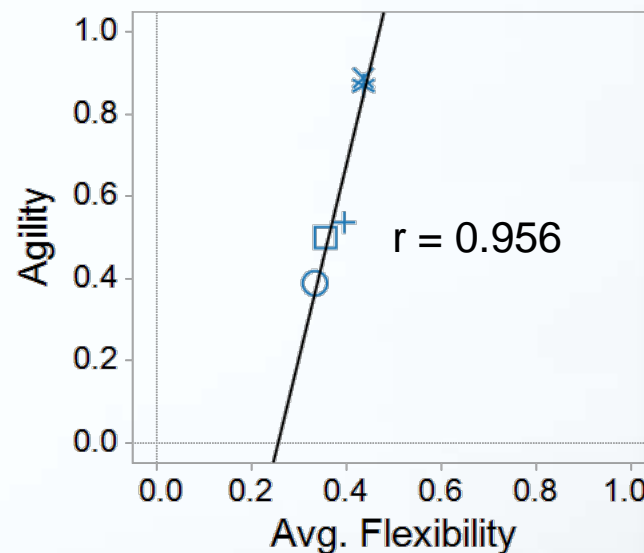
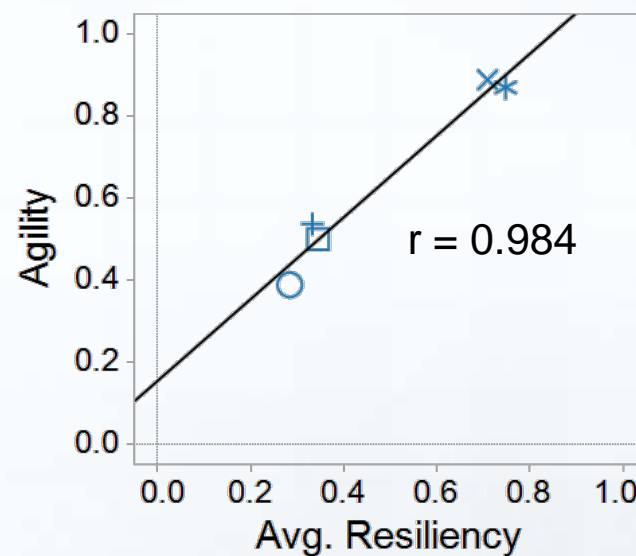
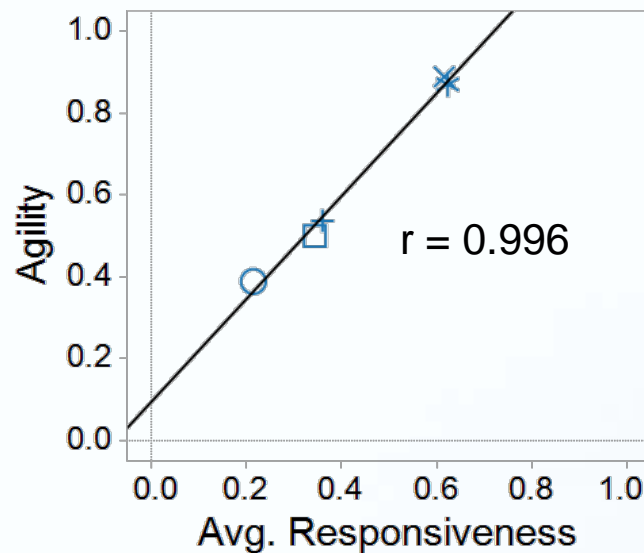
- Responsiveness
- Resiliency
- Flexibility
- *Innovativeness*
- *Versatility*
- *Adaptability*
- “Situational Awareness”



\*Alberts, D.S. (2011). *The Agility Advantage: A Survival Guide for Complex Enterprises and Endeavors*. United-States.

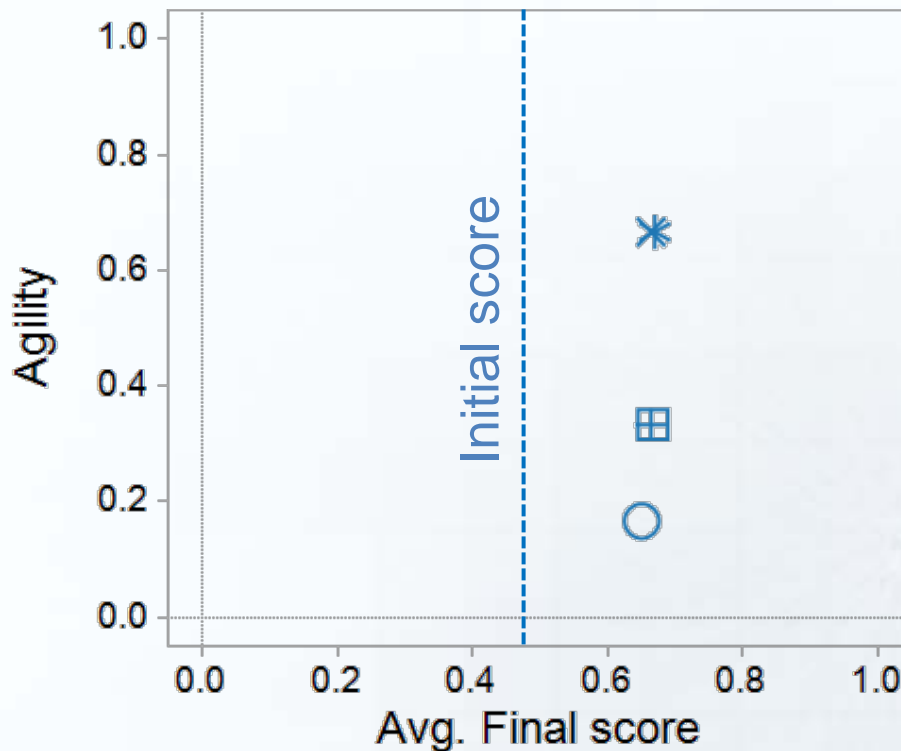


# Results: Correlation



C2 Approach :  Conflicted  De-conflicted  Coordinated  Collaborative  Edge

# Results: Agility vs « global » performance



C2 Approach :  Conflicted  De-conflicted  Coordinated  Collaborative  Edge

- More network-enabled C2 approaches were found to be more agile
- Four enablers of agility, namely responsiveness, resiliency, flexibility and SA, were found to be highly correlated with the measures of agility
- C2 Agility improved slightly the capacity to cope with more change in circumstances but it could be cheaper than relying always on the more network-enabled C2 approach
- Agility was not dependent on the final score, suggesting that increases in agility do not come from a higher level of performance but likely from a shorter reaction time to identify the problems
- This experiment has not evaluated the levels of C2 maturity themselves, i.e. the ability of higher levels of maturity to change the C2 approach according the situation. An indirect measure of requisite agility and C2 agility was provided

- The proactive aspect of agility has not been studied
- Future studies should be conducted in a zero-sum situation. A more fair comparison would consider a same level of resource (e.g. money) for all C2 approaches (e.g. Conflicted should have more units deployed since it saves on communication infrastructure and training)
- There are some “costs” related to the scale of an organization in more capable C2 approaches. These costs should be taken into account in future studies.
- *Edge* should be implemented as a revolutionary instead as an evolutionary approach over *Collaborative*

