

Netherlands Defence Academy

# C2 Systems & Information Sharing in Cross-Cultural Context

Laura Wortel, Tim Grant, Joe Soeters

TJ.Grant@NLDA.nl

Tel: +31 76 527 3261

# Outline

## Goal:

- To report results of literature survey into factors influencing information sharing via C2 systems in a cross-cultural context

## Structure:

- Motivation, definitions, & scope
- Methodology
- Influencing factors
- Cultural levels
- Further research



# Motivation (1)

## Operational trends:

- Coalitions (joint, combined) + non-military partners

## Specific stimuli:

- Dutch Army's ISIS & TITAAN C2 systems
- Designed by Dutch developers for Dutch users
- Used (eg TFF, Macedonia) by multiple nationalities:  
Different languages, organizations, command approaches, etc
- How do you ensure no misunderstandings?

## Analogy:

- Research in aviation & medicine



# Motivation (2)

## NLDA research project NEC-03:

- “Cultural influences on C2 systems”
- Approved 2006
- Goal:
  - To establish whether socio-cultural differences influence design & use of C2 systems. If so, identify impacts on military operations and what countermeasures should be taken
- Resources:
  - One PhD student for 4 years
  - Two Professors (sociologist & operational ICT) advising
- Partner:
  - University of Tilburg, Netherlands
- This paper reports on PhD student’s literature survey:
  - Focus on information sharing

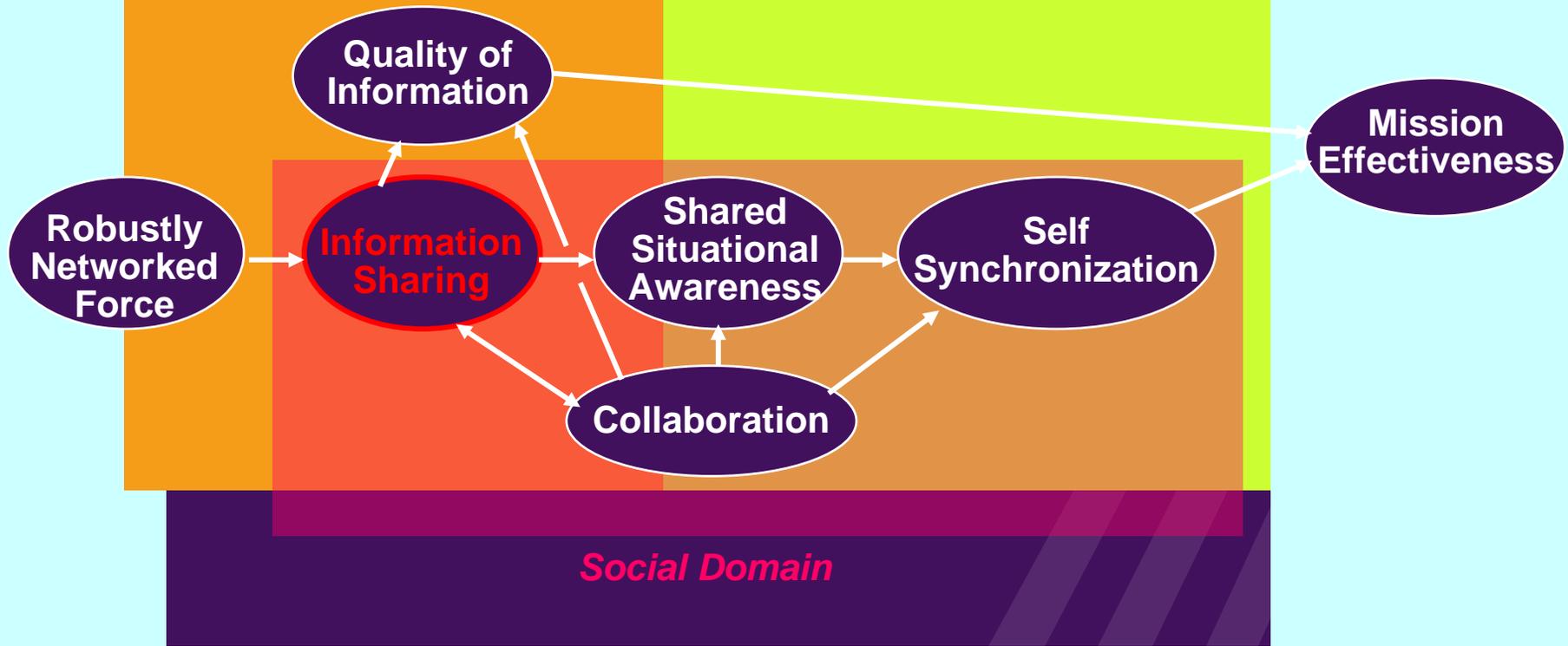
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# Motivation (3)

*Information Domain*

*Cognitive Domain*



*Social Domain*

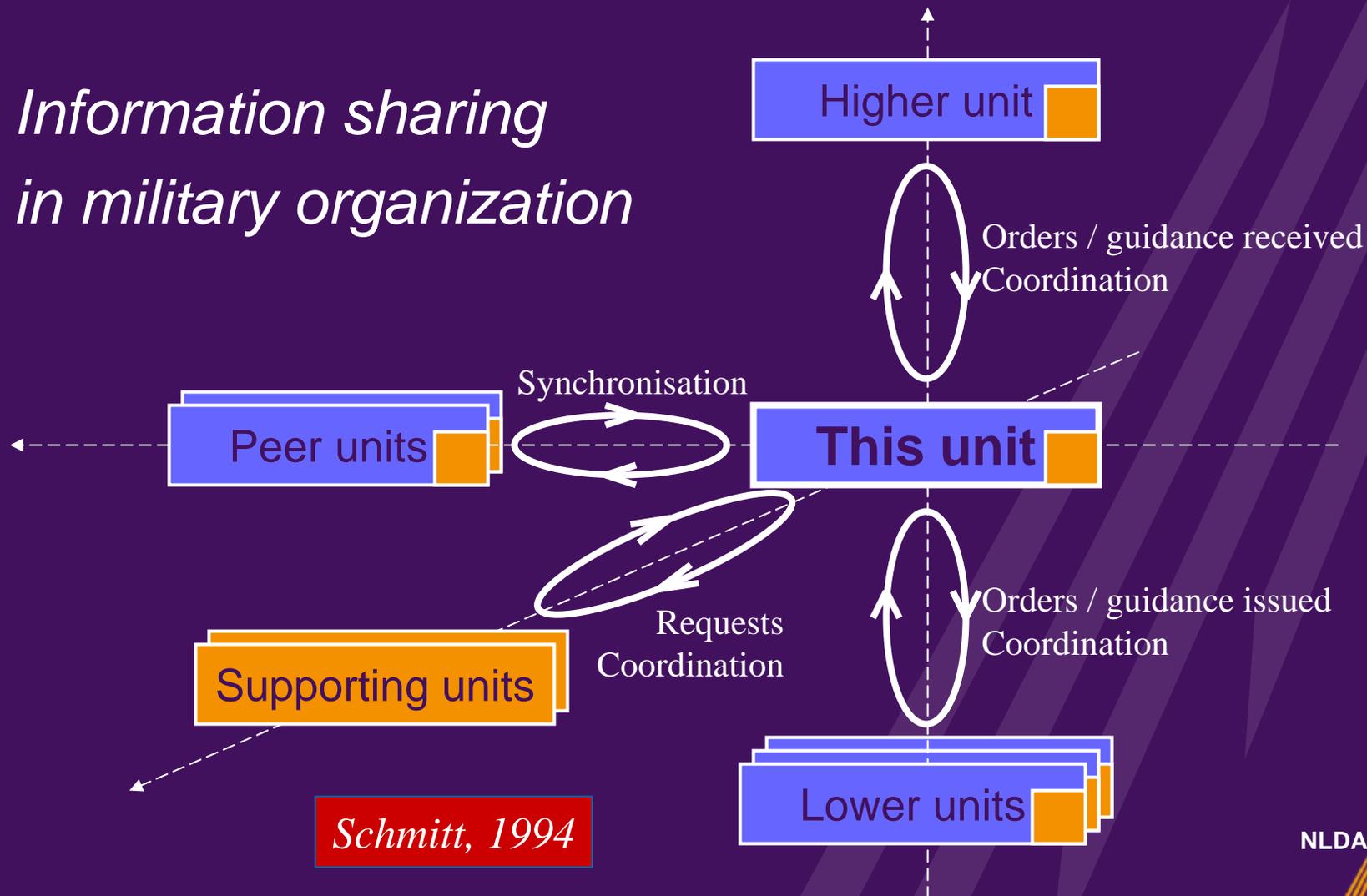
## *NEC value chain*

*Physical Domain*

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# Motivation (4)

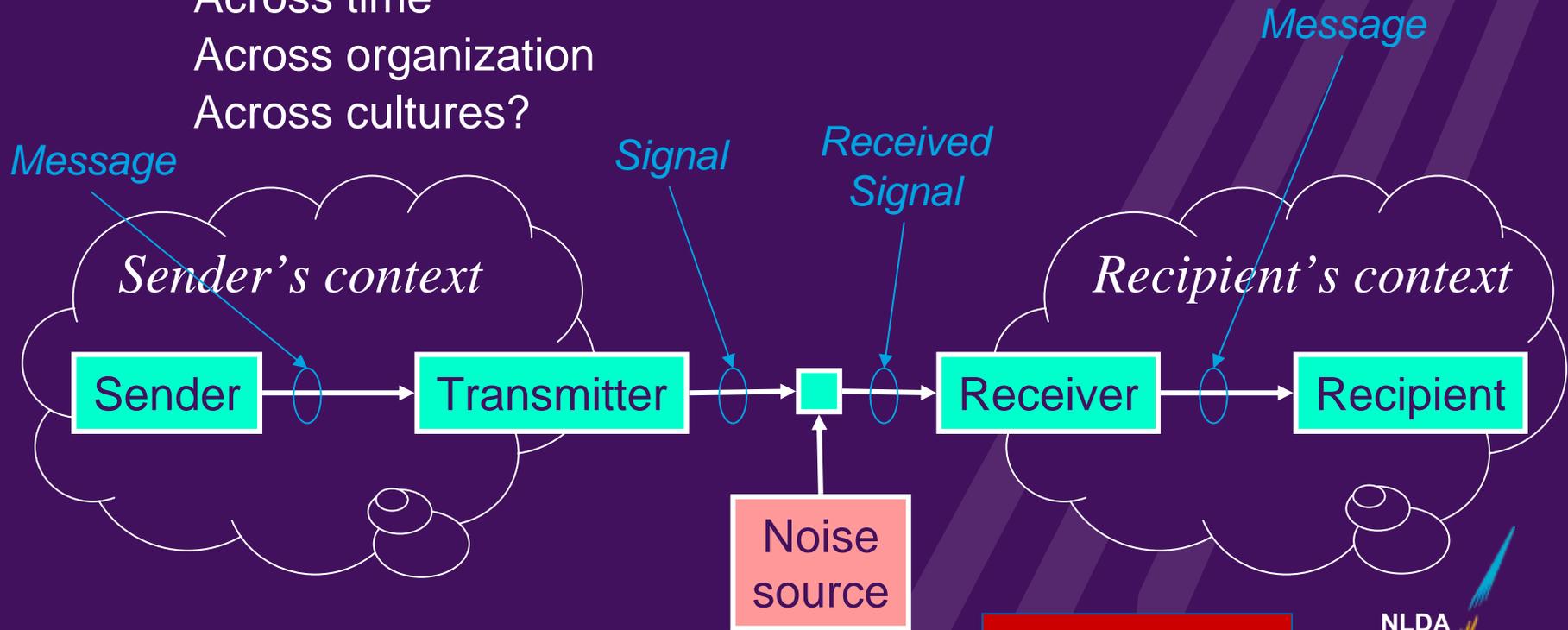
## *Information sharing in military organization*



# Motivation (5)

## C2 system:

- Bottom-line function is to communicate information:
  - Across geography
  - Across time
  - Across organization
  - Across cultures?



*Shannon, 1948*

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# Definitions (1)

## Culture:

- “Collective programming of the mind that distinguishes members of one group or category of people from another”

*Hofstede, 2001*

## Groups or categories of people:

- Military units:  
Platoon, battalion, brigade, squadron, ship's company
- Military specializations / disciplines:  
Infantry, artillery, logistics, pilot, navigator, intelligence analyst
- Military services:  
Army, navy, air force, marines
- Civilians:  
Bureaucrat, supplier, non-profit person, journalist
- Nations & supra-national organizations

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## Definitions (2)

### Granularity of groups / categories:

- Individual:

(In C2 context:) sender & recipient roles

- Team

- Project / department

- Organization

- Domain / market.

E.g. military vs. civilian

- Profession:

Can be sub-culture within organization

Can also span across organizations, e.g. pilot, doctor

- Nation / society

Organizational culture

*Hofstede, 2001*

Professional culture

National culture

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# Definitions (3)

## Dimensions of (national) culture:

*Hofstede, 2001*

- Power distance:  
Extent to which less powerful members of culture expect & accept that power is unequally distributed
- Uncertainty avoidance:  
Extent of feeling threatened by uncertain / unknown situations
- Individualism vs. collectivism:  
Loose ties between individuals vs. strong cohesive in-groups
- Masculinity vs. femininity:  
Distinct vs. overlapping social gender roles
- Long- vs. short-term orientation:  
Fostering of virtues relating to future (perseverance, thrift) vs. relating to present & past (tradition, face, social obligations)

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# Definitions (4)

Data, information, knowledge, wisdom:

- Data = raw data, usually from sensors
- Information = data in context
  - Context is other data, information, knowledge
- Knowledge = actionable information

*Ackoff, 1989*

We make no distinction; it's all information

Information sharing:

- “Dyadic exchange of information between sender and recipient”
- Involves:

Searching / discovery

Encoding & decoding

Transmission & reception (transfer)

Calibration & conversion (e.g. inches to centimetres)

*(Adapted from) Szulanski, 1996*

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# Scope

## Information sharing via information systems:

- C2 system is subclass of information system
- Excludes:
  - Face-to-face
  - Telephone / intercom
  - Radio
  - (Video) teleconferencing

## Literature limited to information transfer:

- Willingness and/or ability to share information
- In C2 context, covers:
  - Interoperability
  - Stove-pipes
- But would also like to study cultural influences on:
  - What information to share
  - What medium to use in sharing it



# Methodology (1)

## Observation:

- Availability of (C2) information system alone does not guarantee that information sharing happens

*(several authors, 1996-2004)*

## PhD research questions:

- What factors influence willingness and/or ability to share information via C2 systems?
- What is impact of cultural differences on information sharing via C2 systems?

## Phase 1: Classic literature survey:

- Focus on information sharing:  
A.k.a. knowledge sharing, knowledge transfer  
In MS / OR, psychology, MIS, & KM literatures



# Methodology (2)

## Management studies literature:

- Academy of Management Review
- Administrative Sciences Quarterly
- International Journal of Business Studies
- Journal of Management Studies
- Organization Science
- Strategic Management Journal

## Psychology literature:

- Journal of Applied Social Psychology
- Psychological Review

## Management Information Systems literature:

- Communication Research
- Information Systems Research
- Journal of Strategic Information Systems
- Journal of Management Information Systems
- MIS Quarterly



# Influencing factors (1)

## Influencing ICT use for information sharing (1/2):

- Information culture:  
Attitude towards information processing, publishing, & communication
- Information ownership:  
Whether creator believes information owned by organization
- Propensity to share:  
Attitude in which social & personal good of sharing weighs more heavily than cost of sharing
- Task interdependence:  
Degree to which person's work depends on others' efforts

*Jarvenpaa & Staples, 2000*

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# Influencing factors (2)

## Influencing ICT use for information sharing (2/2):

- Computer comfort:  
Individual's attitude toward computers
- Information characteristics:  
Degree to which individual believes information enhances his/her work
- Demographic characteristics:
  - Training
  - Experience
  - Staff type
  - Gender
  - Age
  - Educational level
  - Time in present job

*Jarvenpaa & Staples, 2000*



# Influencing factors (3)

## Other influencing factors:

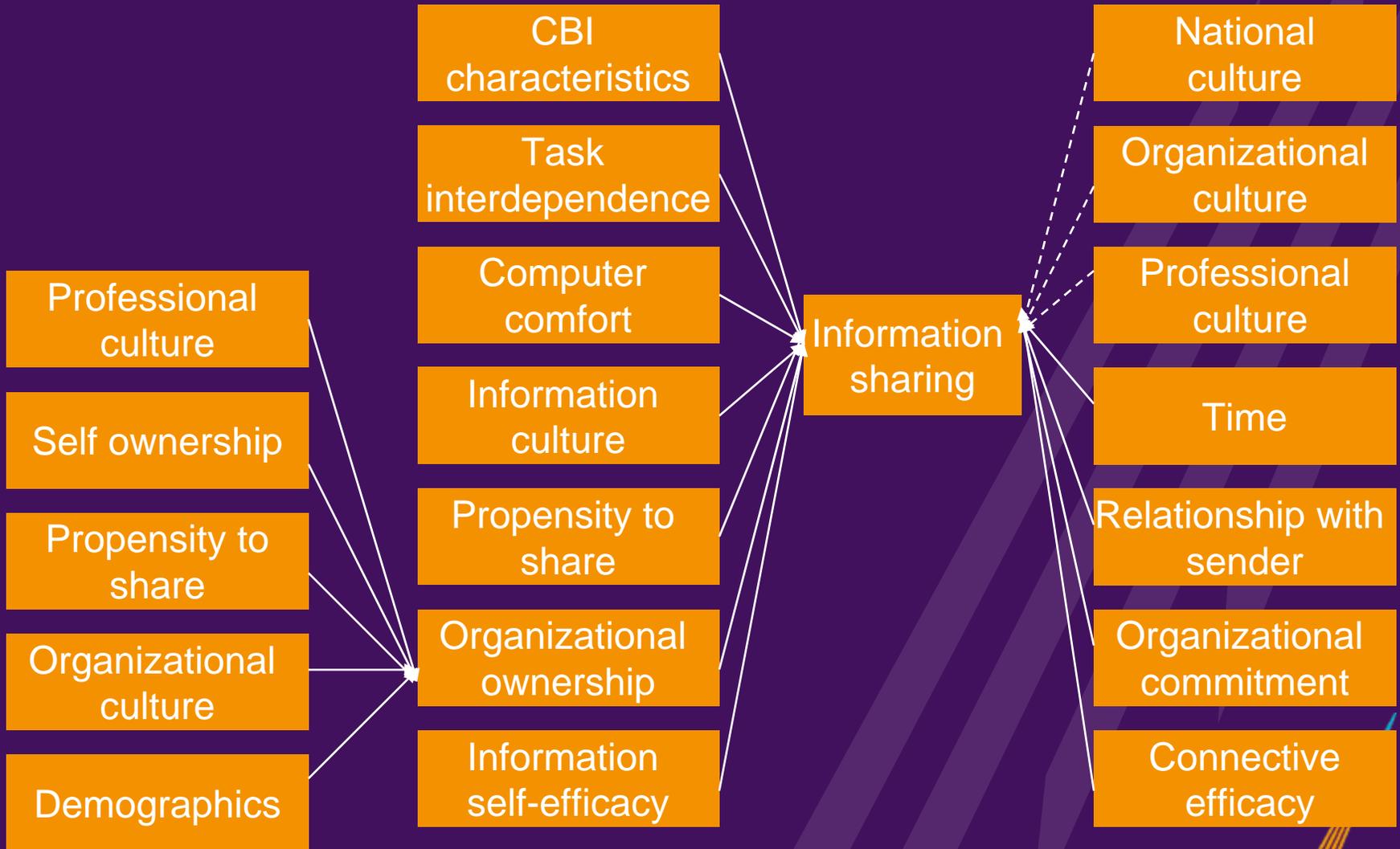
- Relationship between sender & recipient:
  - Social exchange; history of recipient's reciprocal behaviour
  - Amount of time sender & recipient expect to work together
- Connective efficacy:
  - Sender's expectation that information will reach others
- Information self-efficacy:
  - Sender's perception of value of information to others
- Time:
  - Whether senders have time to provide information
- Organizational commitment:
  - How committed sender is to organization

*(various authors)*

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# Framework



# Cultural levels (1)

## Influence of national culture:

- Five dimensions:

  - Power distance

  - Uncertainty avoidance

  - Individualism vs. collectivism

  - Masculinity vs. femininity

  - Long- vs. short-term orientation

*Hofstede, 2001*

- Confirmed:

  - Individualism has negative effect

  - Power distance has positive effect

*Chow et al, 1999*

- Not confirmed:

  - Uncertainty avoidance has negative effect

# Cultural levels (2)

## Influence of organizational culture:

- Seven dimensions:

Norms regarding completion of work tasks:

- Attention to detail
- Stability
- Innovation

*O'Reilly et al, 1991*

Norms regarding interpersonal relationships:

- Team orientation
- Respect for people

Norms regarding individual actions:

- Outcome orientation
- Aggressiveness

- Hypothesised:

Strong: Respect for people, Innovation, & Stability

Moderate: Team orientation & Outcome orientation

Weak: Attention to detail

- Confirmed:

Person-organization fit

*McKinnon et al, 2003*

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# Cultural levels (3)

## Professional culture:

- Sub-cultures (of organization):

Enhancing

Deferential

Dissenting

Orthogonal

*Bloor & Dawson, 1994*

- Suggestion that professional culture influences:

Information sharing indirectly through:

- Information culture
- Information self-efficacy

*DeLong & Fahey, 2000*

& perhaps information sharing directly

- No experiments reported in literature
- What about professions that run across organizations?  
E.g. military as profession, pilots, doctors, maintainers, etc

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# Further research

## Validate framework:

- Questionnaire + contrastive vignette
- Partial least squares analysis to find contributions
- Open-ended questions to elicit reasons for sharing

## Case studies:

- Interviews & observing multi-national exercises
- Content analysis

## Determine countermeasures:

- Literature review & interviews
- Test by experimentation



# References

Additional references in this presentation:

- Ackoff, R. 1989. From Data to Wisdom. *Journal of Applied Systems Analysis*, 16, 3-9
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- Schmitt, J.F. 1994. A Concept for Marine Corps C2. In Levis, A.H. & Levis, I.S. (eds). *Science of Command & Control, Part III*, AFCEA International Press, 13-26



# Any questions?

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