



# From Function to Form in the Design of C2 Systems

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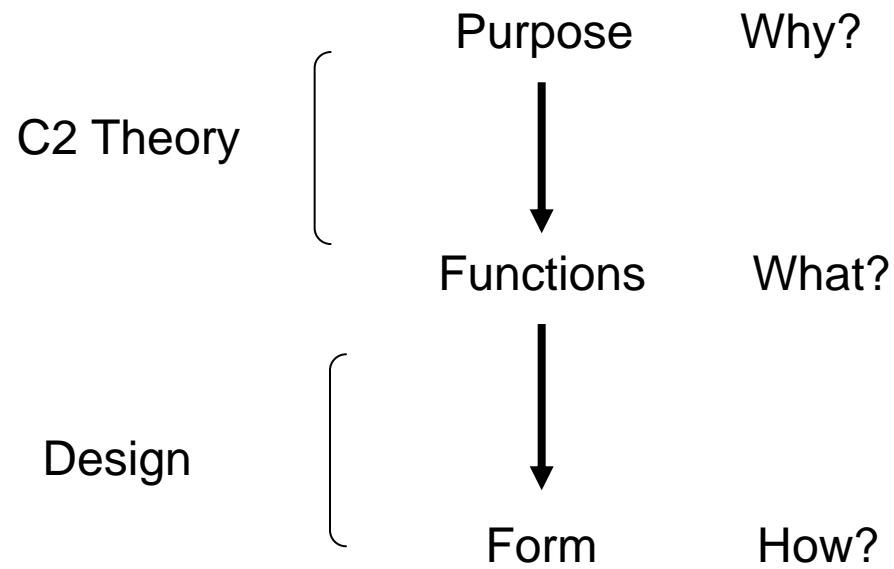
# Outline

- A design perspective on C2
- Factors that make C2 systems similar
- Factors that make C2 systems different
- A model of C2 systems comprising both sets of factors
- Application of the model to the problem of centralization of C2
- Conclusions

# The point of departure: a design perspective on C2

- C2 is the function of the military system that provides direction and coordination
- It is performed within a C2 system comprising the organization, methods, procedures and support systems used
- The C2 system thus shapes C2 as an activity
- C2 systems are artifacts and they are best understood in terms of the logic of design

# Design logic



# C2

- The *purpose* is to provide direction and coordination
- The *functions* are data collection, sensemaking, planning and communication
- The *form* is the C2 system consisting of the organization, methods , procedures and support systems

# Factors that shape C2 systems

- The step from function to form will reflect our current understanding of what is required to achieve the functions
- We are currently not able to derive form from function very precisely
- This means that there is room for a variety of factors to affect the design process and as a consequence, C2 systems will exhibit both similarities and differences
- The *similarities* stem from the C2 systems being designed to achieve the same purpose and are explained by the design perspective
- This paper will be concerned with the factors that make C2 systems *different*

# Five factors that contribute to differences among C2 systems

- Technology
- Command requirements
- Command possibilities
- Command culture
- Legal requirements
- These factors are *not* independent and it is an important task to understand how they interact

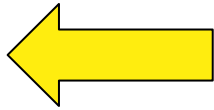
# Technology

- Technology should be understood in a wide sense
- Communication and representation technology
- The most important step was taken when officers became able to read and write, making “command at a distance” possible. Much of the later technological development has been a question of finding means to extend this
- The ability to transmit and process great amounts of information



# Command Requirements: The Janus Face of C2

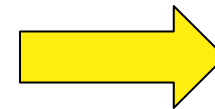
Looking  
inwards



Own  
resources



Looking  
outwards



The situation in  
which the mission  
must be  
accomplished

*Sun Zi:* If you know yourself and know your enemy, you  
need not fear the result of a hundred battles

*Sensemaking:* understand the mission in terms of what needs to be done in the situation

# Command requirements

- Staffs are getting larger and larger because of more different forms of resources and more varied and difficult missions
- The need to handle different time horizons makes staffs at higher levels larger

# Command possibilities

- This refers to the possibility of effectively achieving the functions
- Obtaining and transmitting information are crucial factors here as well as the possibility of handling the control span problem
- The kinds of troops available
- This factor has its greatest effect via its effect on how command is exercised
- Mission command vs. command by plan are methods designed to overcome limited command possibilities

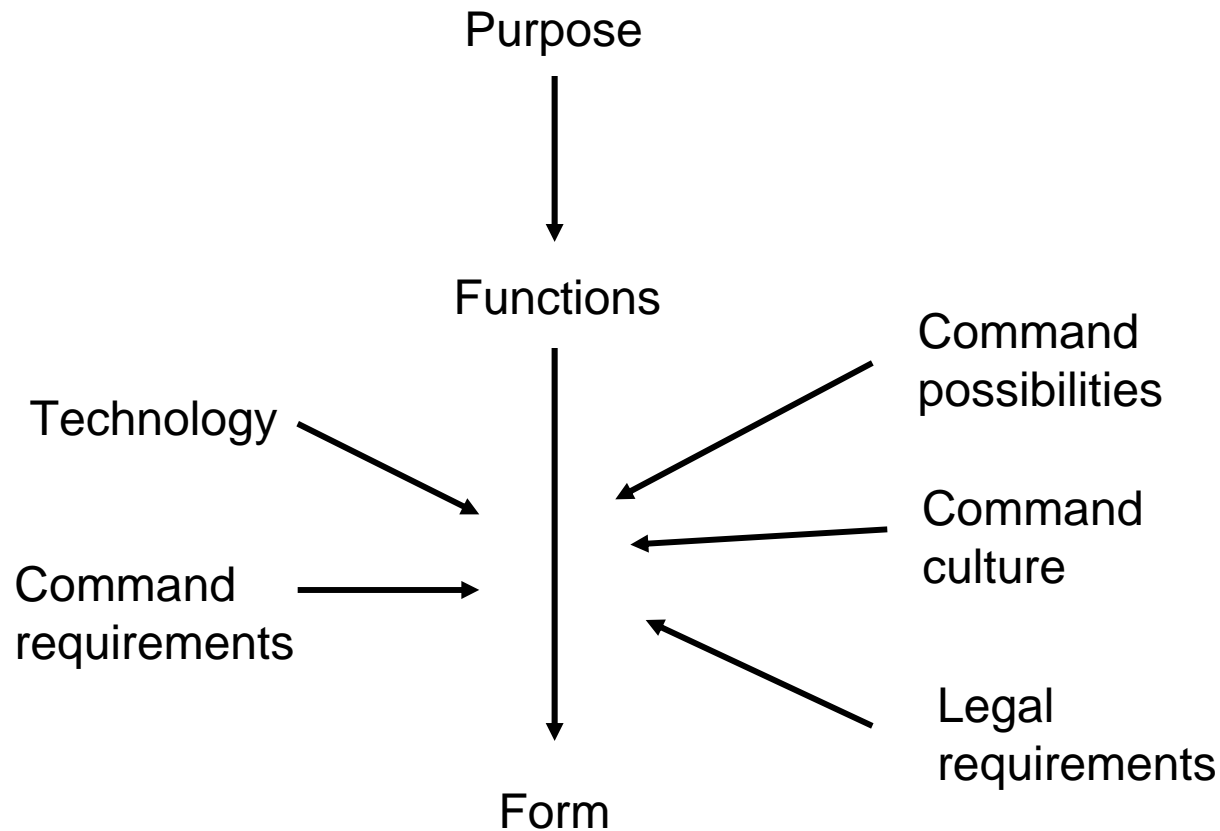
# Command culture

- The command culture reflects beliefs about how C2 must be conducted
- It reflects the historical experience of an armed force and it is based on beliefs about the nature of war and the nature of people (especially subordinates)
- Command cultures also differ between services

# Legal requirements

- From the right to make decisions and have them obeyed follows responsibility for these decisions
- The practice of C2 is embedded in national and international law

# A general model of the factors that affect the form of C2 systems



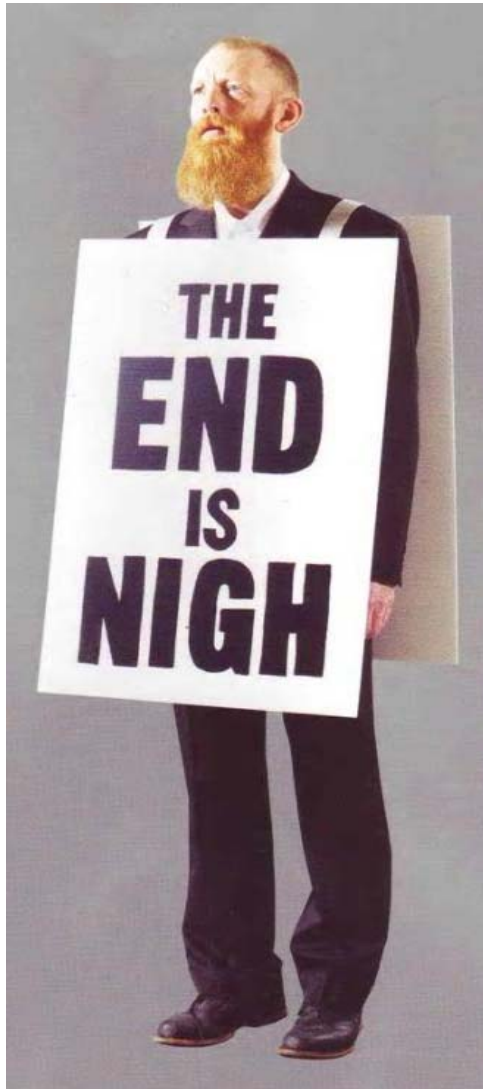
# Centralization of C2

- C2 systems differ widely with respect to size and centralization
- Technology first worked towards increased centralization, but now opens up possibilities for increased decentralization
- Command requirements seems to have no special implications with respect to centralization even though it affects the size of staffs
- Limitations in command possibilities with respect to information have favored decentralization while limitations in competence and trust have favored centralization
- Conceptions of war as chaotic have favored decentralization while limitations with respect to competence and trust have favoured centralization
- Legal requirements have favored centralization (need to find a responsible commander) but new forms of technology may lead to new possibilities here

# Conclusions

- Technology is only *one* of the important factors
- Our lack of knowledge when it comes to designing C2 systems (deriving form from function) gives room for other factors to affect the final form of the system
- Our beliefs about the nature of war and the trust that we have in the capabilities of our subordinates seem especially important
- They make it difficult to introduce new forms of C2 and will probably insure that C2 systems will differ also in the future





Only the possibility to  
ask questions remains