

# **SOCIAL & TECHNICAL ASPECTS OF C2/C3I/C4I**



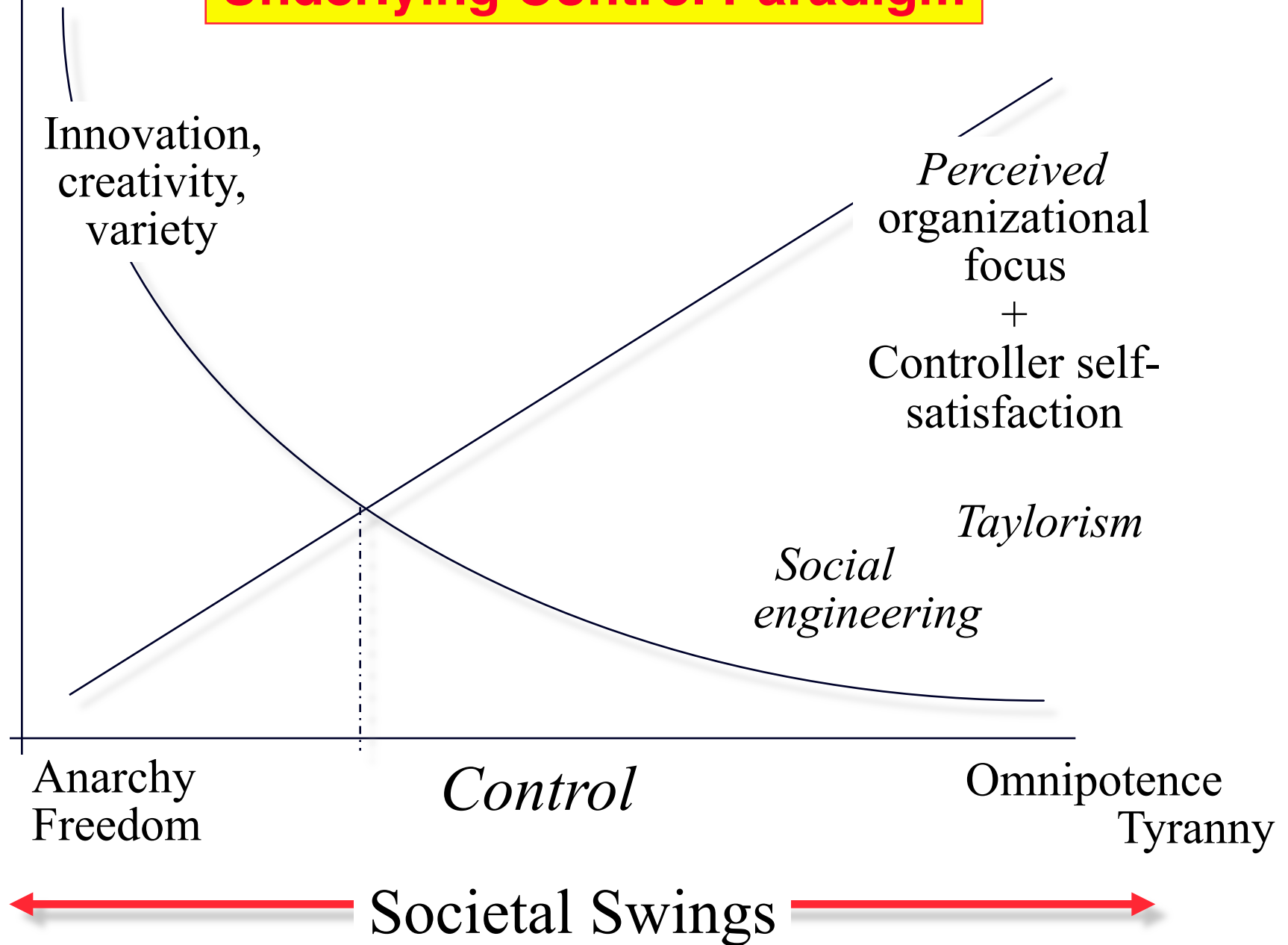
Professor Derek K Hitchins

## Who cares?

- In a democracy, military action is under political control—“by the will of the People”
- As social orders change, so do military tasks
- e.g. from MAD, SDI, cold war confrontation, to...
- Soviet Union domino collapse, NATO expansion, to...
- Social fragmentation throughout western world, to...
- Local, tactical wars with potential for global conflagration, to...
- Peace-making/enforcing, -keeping, -building

*Vital for future senior officers to understand  
social dynamics, their implications w.r.t. C<sup>2</sup>  
—of what, by whom and how!*

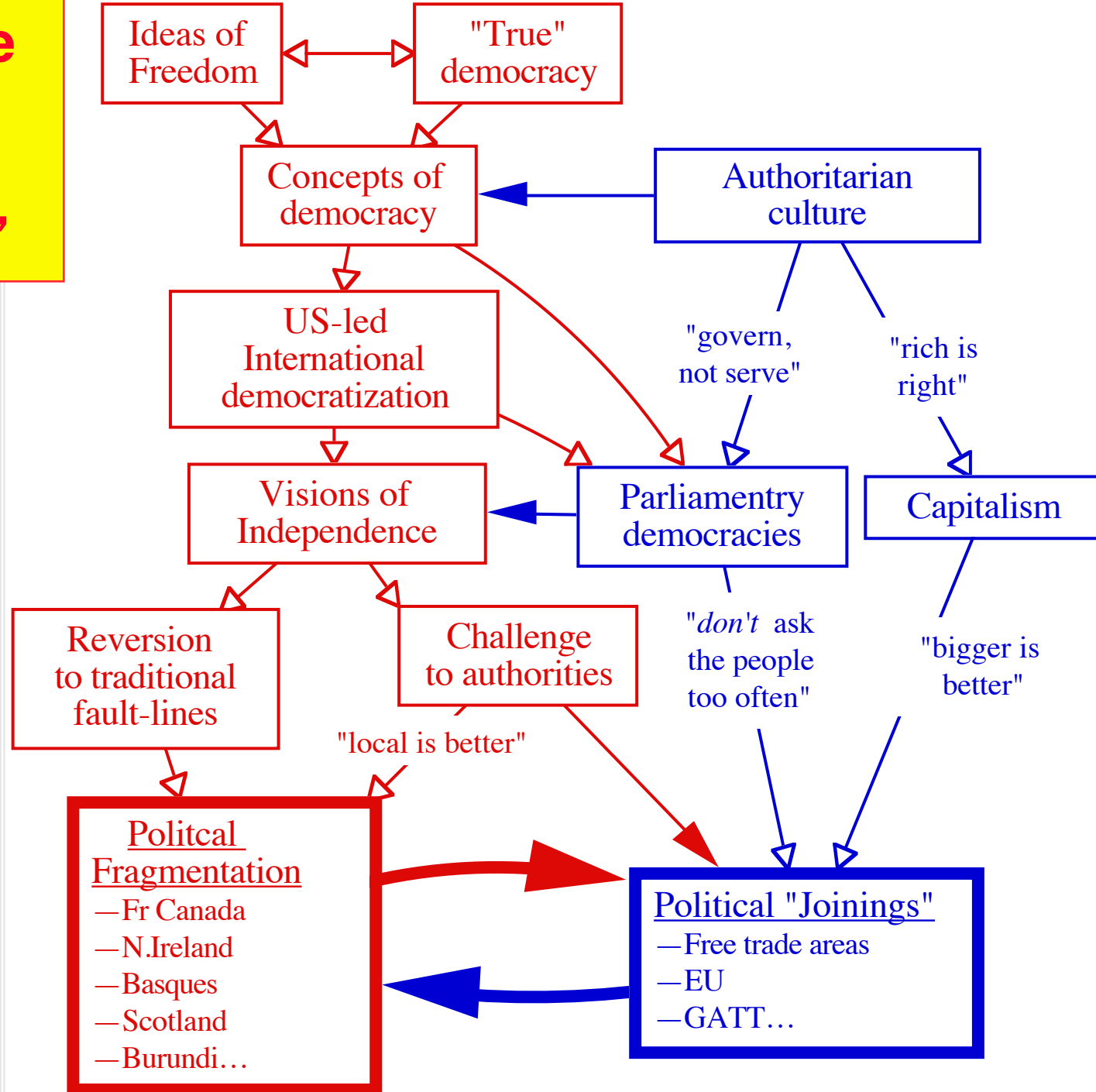
# Underlying Control Paradigm



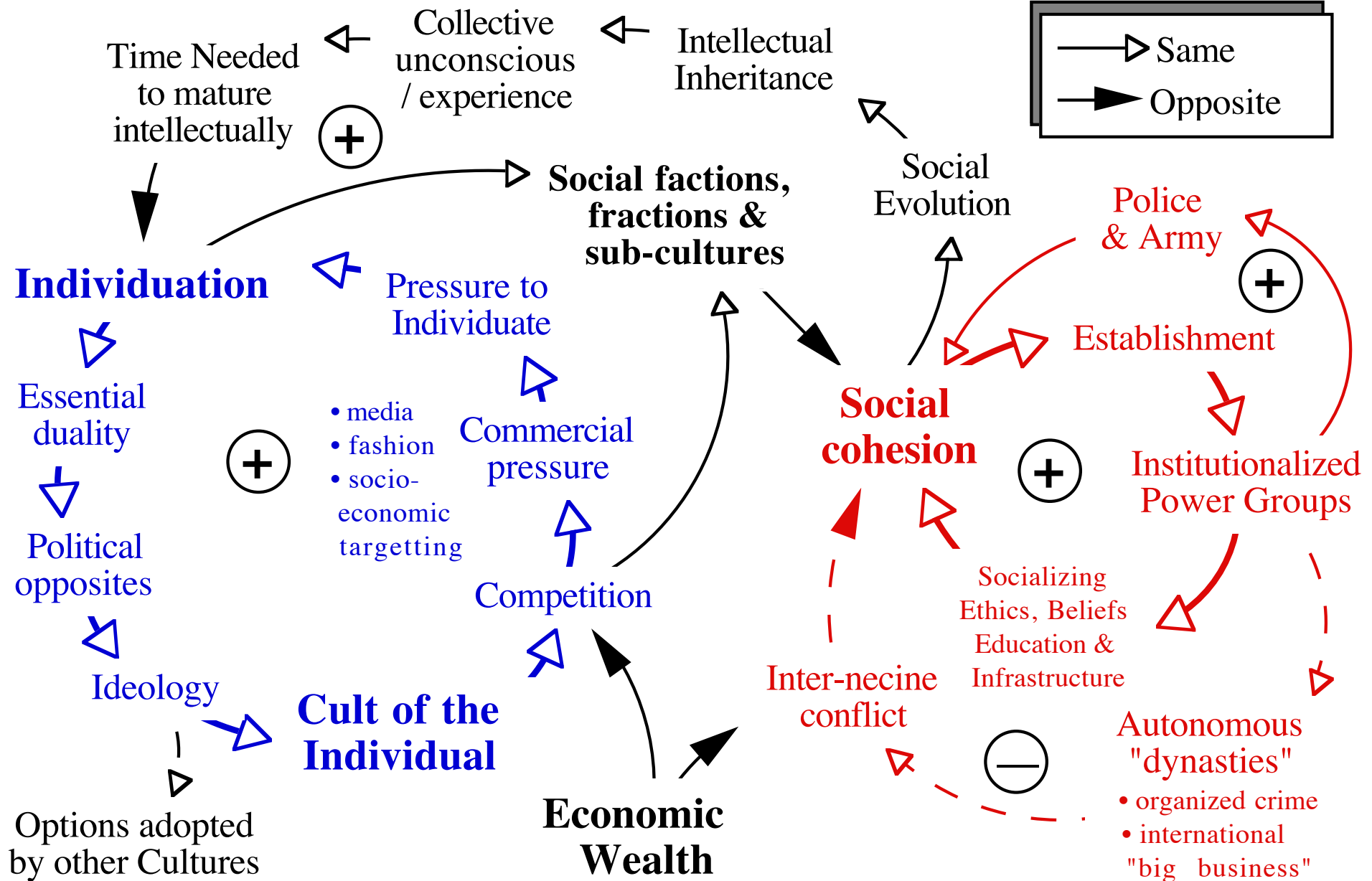
**Following Sequence from  
International C<sup>2</sup> Conferences  
“Societal Archetypes &  
Low Intensity Conflict”**

**“...contains the seeds of its own destruction...”**

- Represents macro-view of today's world... but...
- What is driving all this beneath the surface...?
- How will it all end?
- (Wring hands... exit stage Left)



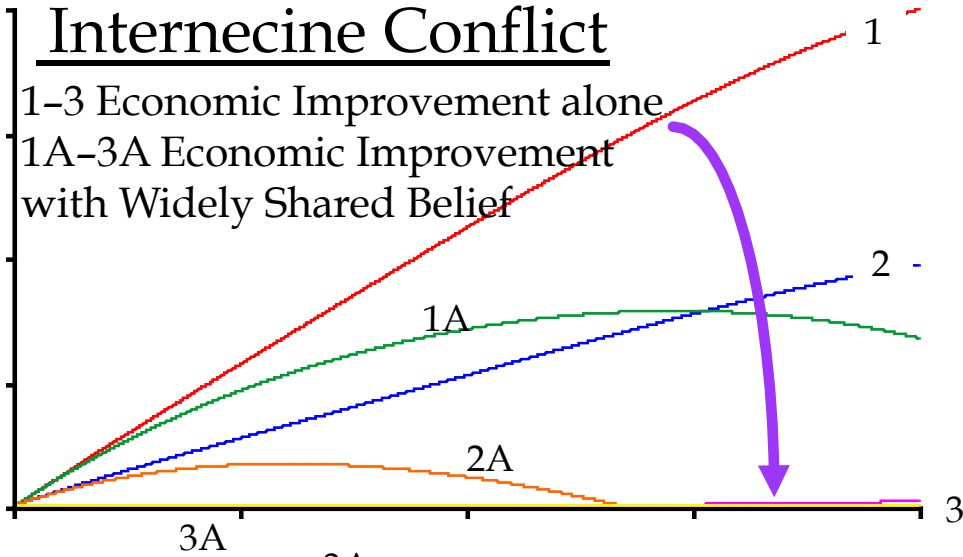
# Western Culture—on a Knife Edge



# Western Culture—Simulation

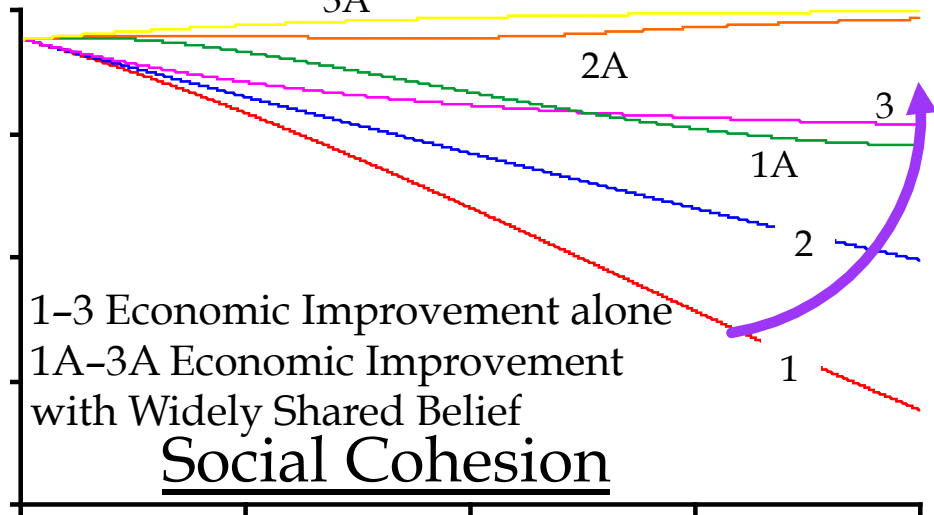
## Internecline Conflict

1-3 Economic Improvement alone  
1A-3A Economic Improvement  
with Widely Shared Belief



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1A-3A Economic Improvement  
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## Social Cohesion

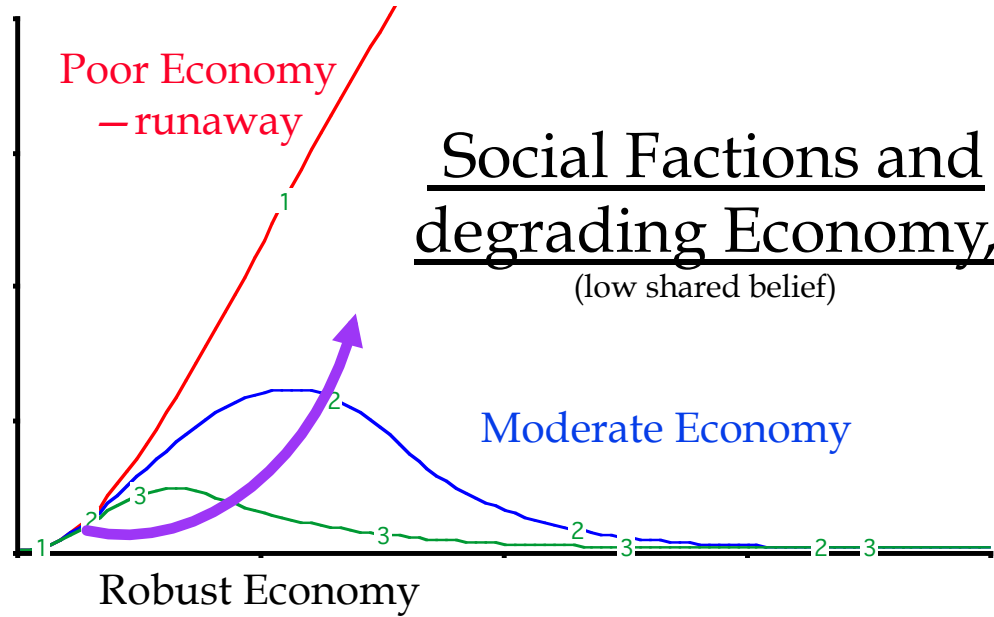


Poor Economy  
—runaway

## Social Factions and degrading Economy,

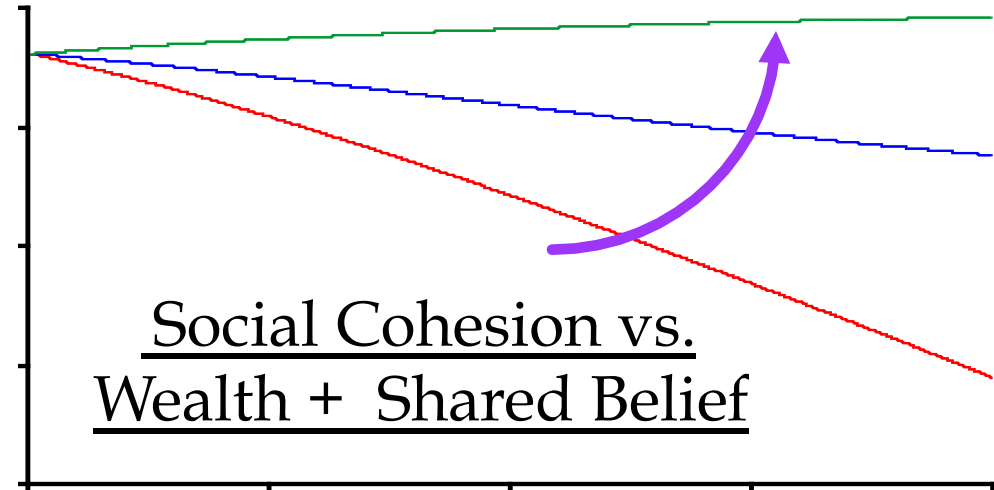
(low shared belief)

Moderate Economy



Robust Economy

## Social Cohesion vs. Wealth + Shared Belief

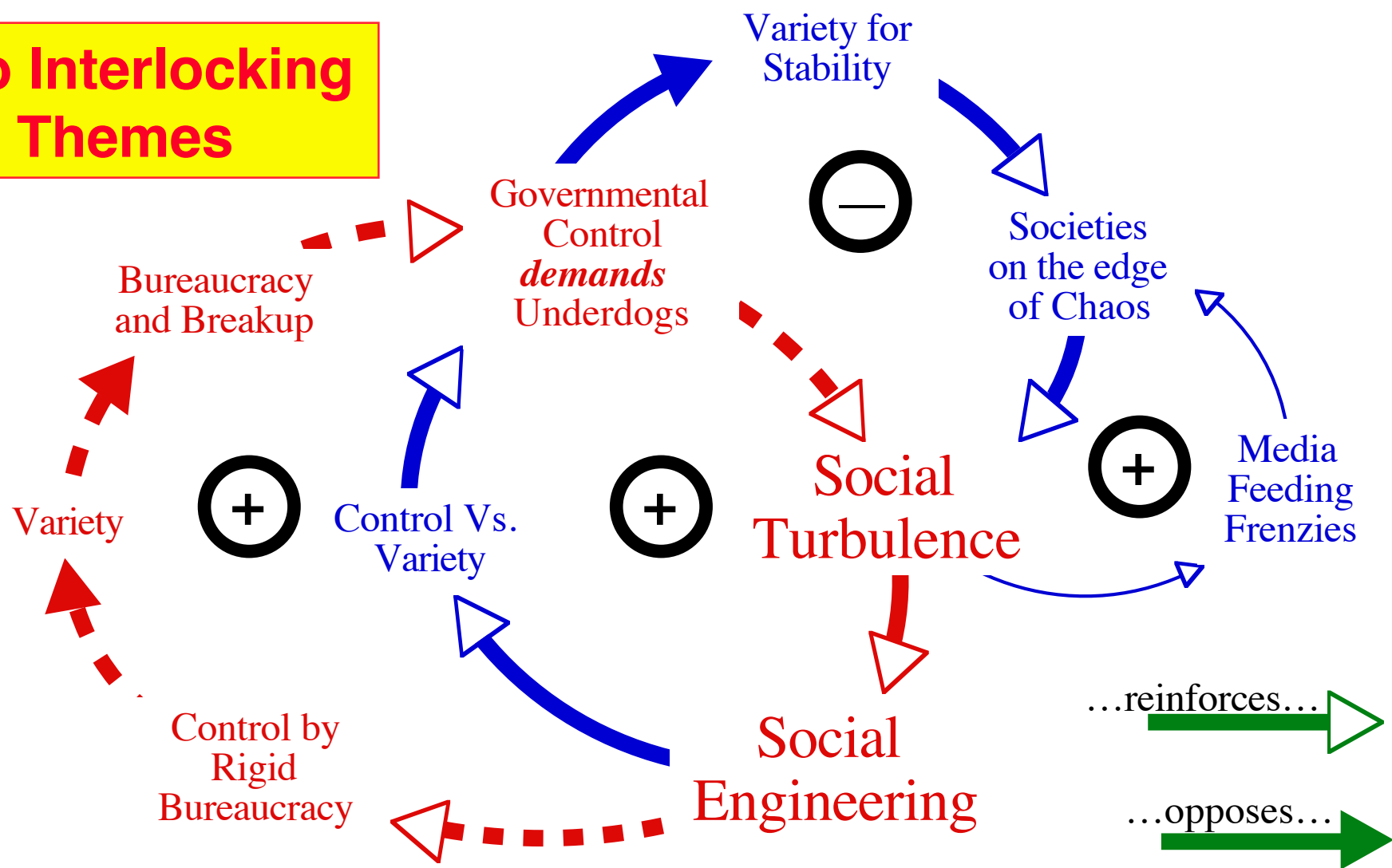


# Deduction From Analysis of Western Culture

- Factions generate spontaneously, esp. in weaker economies
  - economic pressure for competition
  - individuation
  - degraded infrastructure
- Small changes in shared belief cause big changes in social behaviour, esp. with weak economy
- Stronger economies may still generate internecine strife, but need not lose social cohesion
- Robust Economy not enough—some common, shared belief/ethic/behaviour pattern needed too

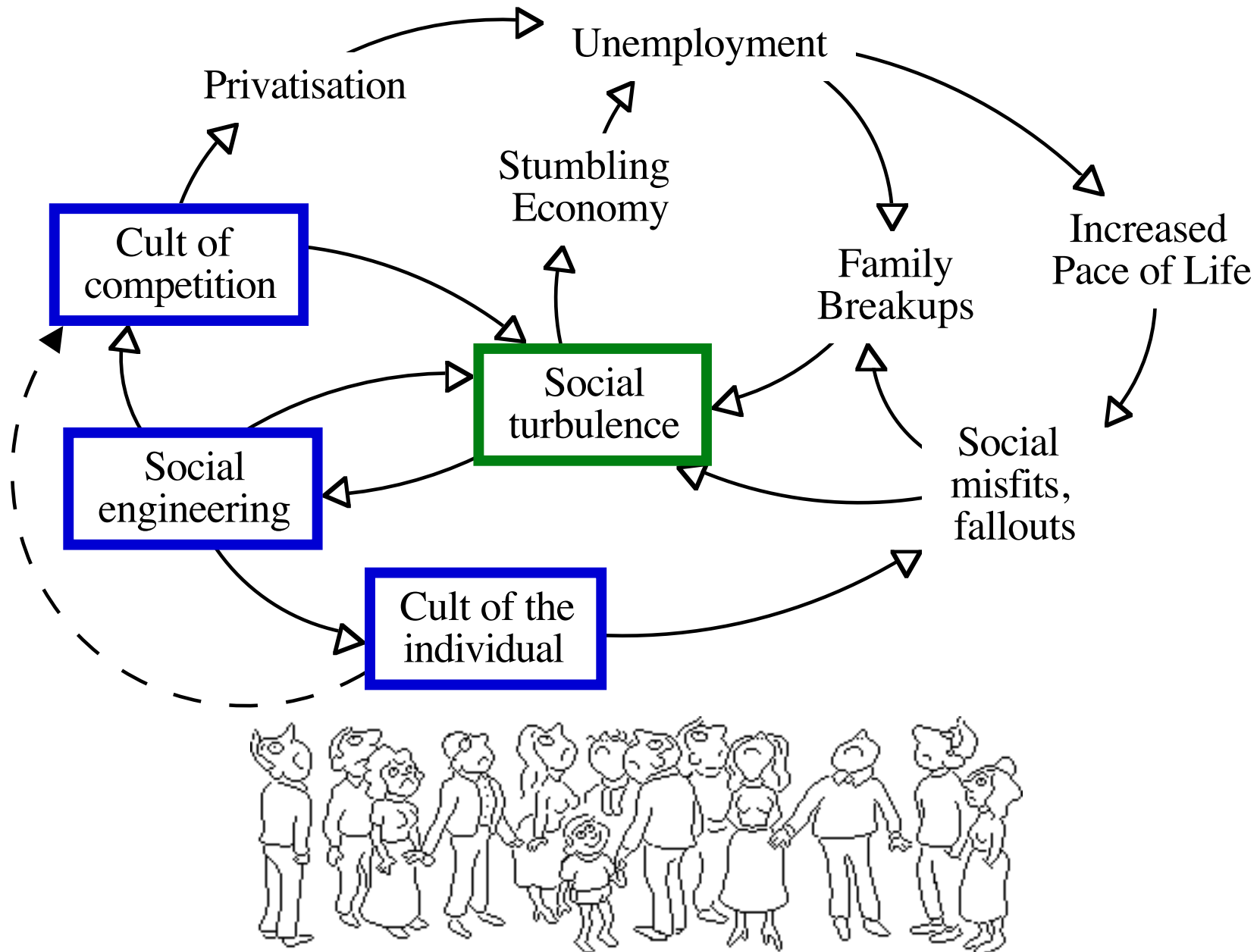


# Two Interlocking Themes



- **1. Red**—Government Controls *create* turbulence by suppressing variety
- **2. Blue**—Societies exist “on the Edge of Chaos”. Avoiding catastrophic decay demands variety—but **1...?**

# Social Engineering—Prime Driver of Social Turbulence

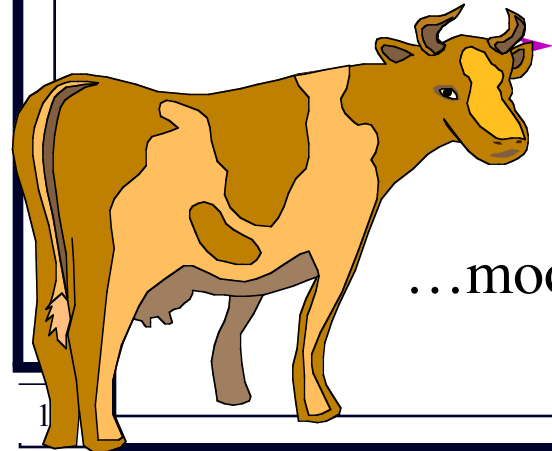


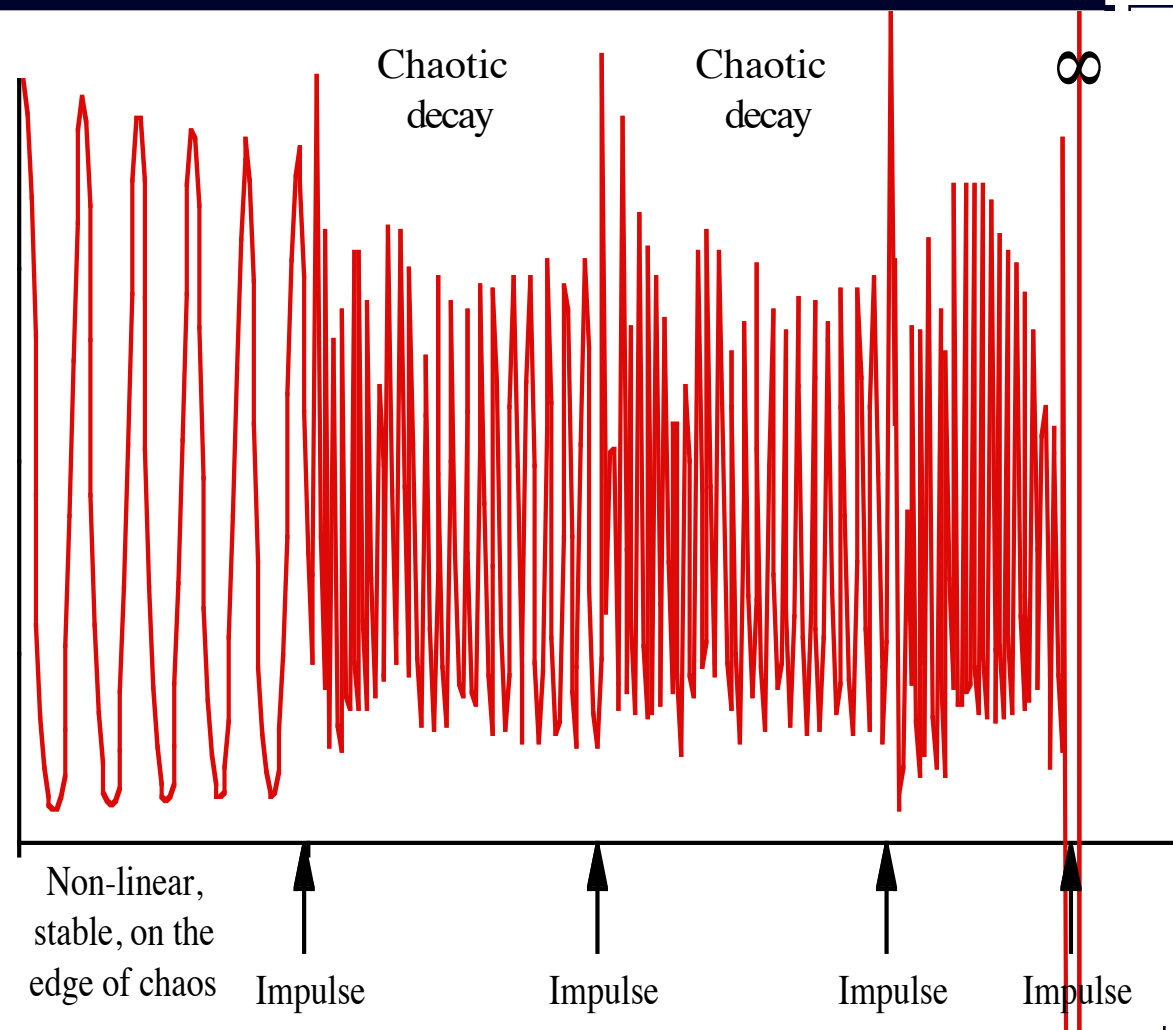
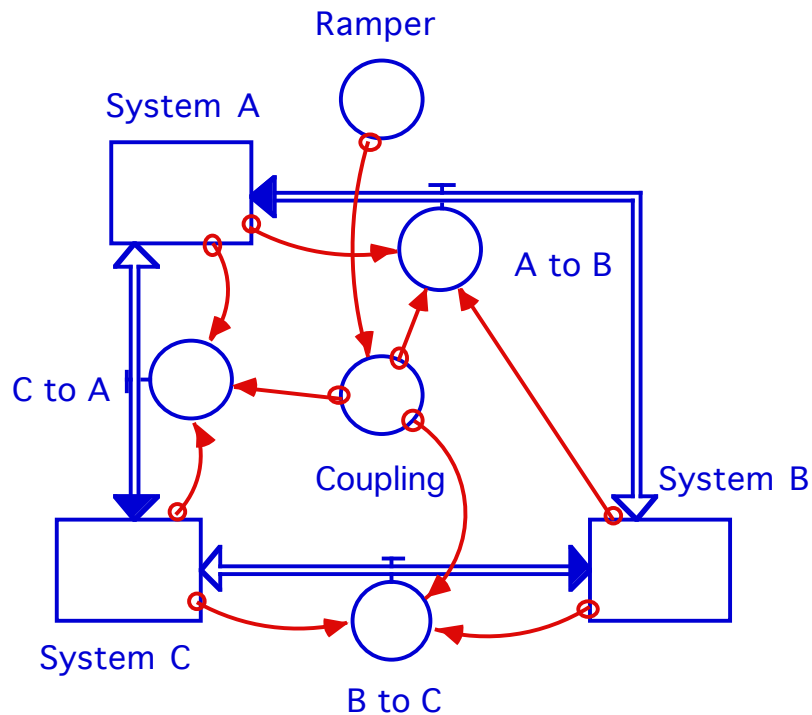
# “Scares” — Society on the Edge of Chaos

- BSE-into CJD, baby-milk, eggs (Lysteria Hysteria), the Pill, BSE-into-mutton-into CJD...
  - scare, after scare, after scare
- Societal state: —
  - self-organized criticality — dynamically-stable (?), turbulent condition
  - build-up of societal tension — scare — societal catharsis(?) — build-up of societal tension...
  - fractal, not periodic — like crime, war, stock market, earthquakes...

➤ But, is this state *really* stable?

...moo — ME?





Each impulse increments prior turbulence,  
until final impulse cause total instability

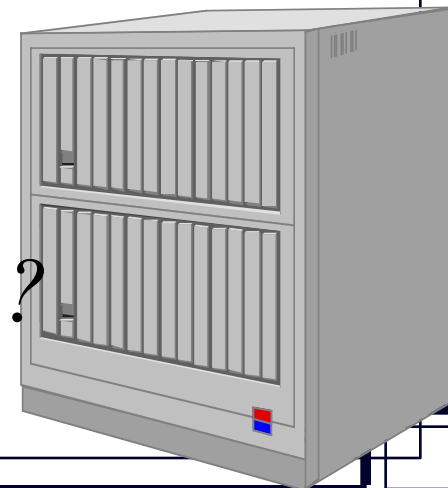
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**Successive “Scares” Leading to Catastrophe**

# Paradox

- Current governing/ business paradigms
  - demand ever more information
  - to exercise ever more *Control*
- Inevitably control suppresses variety..
- ... requiring conformity, uniformity
- Leading to...
- Moribund Decay, Breakdown, Chaos...

*Could this apply to C2/CIS too?*



**Current Technological Trends—  
Following Sequence examines  
Radical shift in C<sup>2</sup> Technology,  
Operation & Support**

# Commercial Dominance

- Defence priorities no longer dominant w.r.t. C<sup>2</sup>/C3/C4i technologies
  - C4i/CIS uses same IT as commercial IS
  - MODs no longer major buyers
- Commercial market shifting:—
  - From mainframe through super mini to networked PCs
  - Microsoft, Intel, IBM, AT&T
  - sub-micron processor chips, PentiumPro  $\geq$  400M
  - RISC chips, PowerPC  $\geq$  500M, copper substrates...
  - $\geq$  900MHz working in development
  - from remote dumb terminals to triple layer client-server
  - explosive growth in networking and ownership
  - pages to relational to object databases
  - from Internet to Intranet
  - from UNIX to Windows NT to L\*\*\*\*

# Commercial Off-the-Shelf (COTS) Hardware

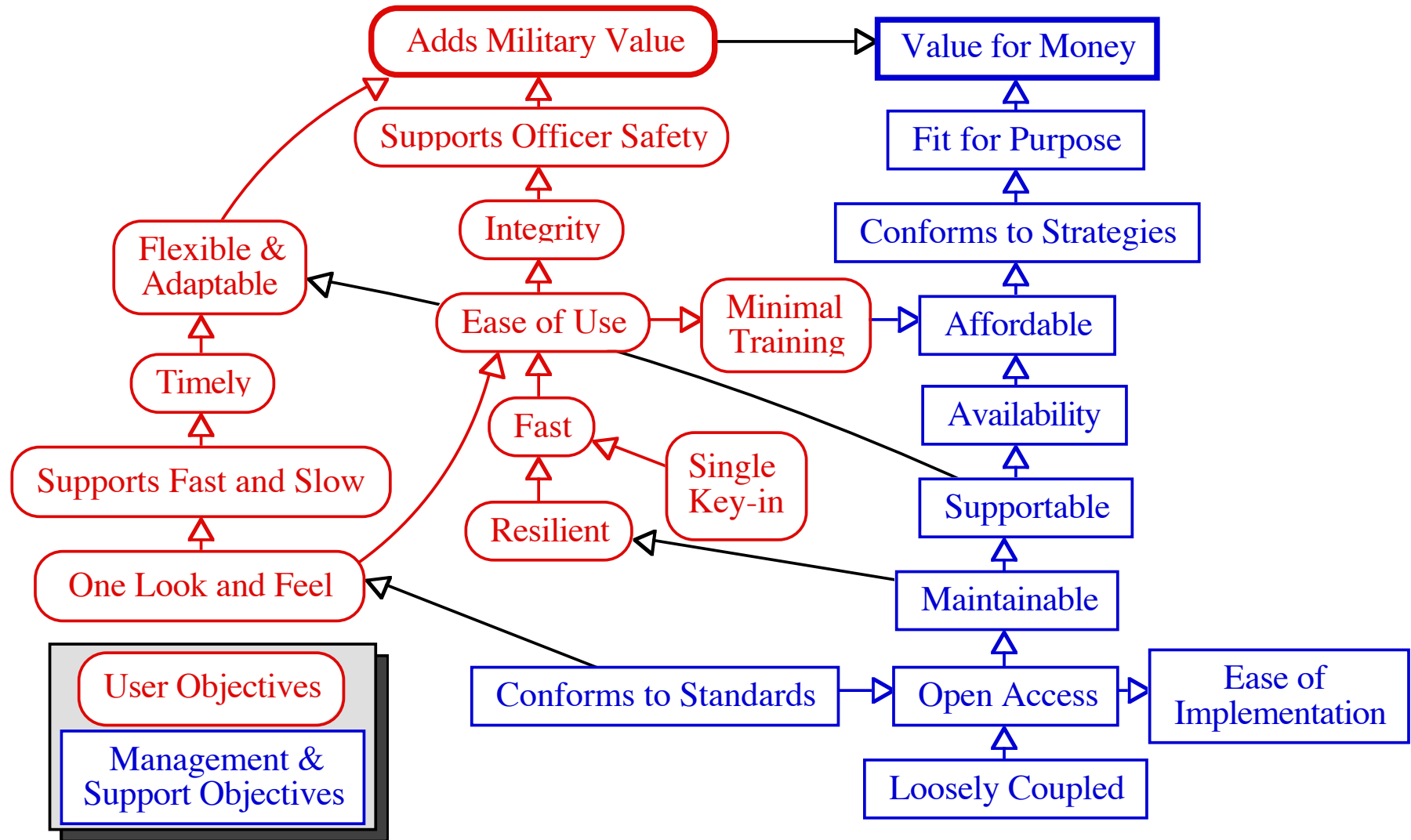
- Growing use of COTS :—
  - specialist military hardware expensive, soon outdated
  - COTS available, tangible, inexpensive
- COTS presents new problems:—
  - performance, reliability in military environment?
  - long-term availability?
  - military security?
  - high performance integrated systems without modifying discrete COTS products
- Complete new way of thinking for military/defence customer



# Implications of COTS and COE on continuing Performance, Availability, Maintenance

- Supplier will maintain neither ageing COTS nor outdated COEs/Applications
- “Going commercial” means:—
  - “guessing” which way the market is going
  - buying for a short life—2 - 4 years
  - continual upgrading to surf the crest of developing technologies, software versions, operating systems
  - continual review to anticipate problems ahead
- Provided it works, C4i/CIS continually improves throughout extended life
  - cf. current approach where bespoke customer owns outdating, obsolescent equipment for 10 - 20 years

# Typical IS Contribution Tree



Gives goals for IS policy and strategy

# System Vs. Service Provisions

- **System provision**—conventional procurement, operation and support by customers/users
  - customer staff become surrogate technicians
  - customer establishes full operations, support, etc
  - independence, capital cost
- **Service provision (Facilities Management)**—contractor purchases, integrates, owns, installs, supports, upgrades, etc.
  - customer defines the need
  - customer uses facilities, dependence, low outlay
- Service provision more attractive to customer in dynamic technological and business environments
  - but, can hollow-out customer—loses technology expertise

- Internet within an organization. Works across existing networks, ties legacy systems into new systems, speeds up communication, reduces paper, etc.
- Browsers, TCP/IP & HTML key features
- Can establish "Private Virtual Network" encompassing local and geographically dispersed groups.
  - Firewall and/or encryption
- Change to work practices:—
  - Every group sees what others are doing. Co-operation/competition potentially enhanced.
  - Energy, money spent on internal paper communication, current delays in that process, dwindle almost to nothing.
  - Information presented/published by owners, improving accuracy and timeliness - hierarchy can see it, do not introduce delay.

# **Some Psychological Thoughts**

New Technology enabling much greater  
inter-connectivity between increasingly  
fragmented societal groups

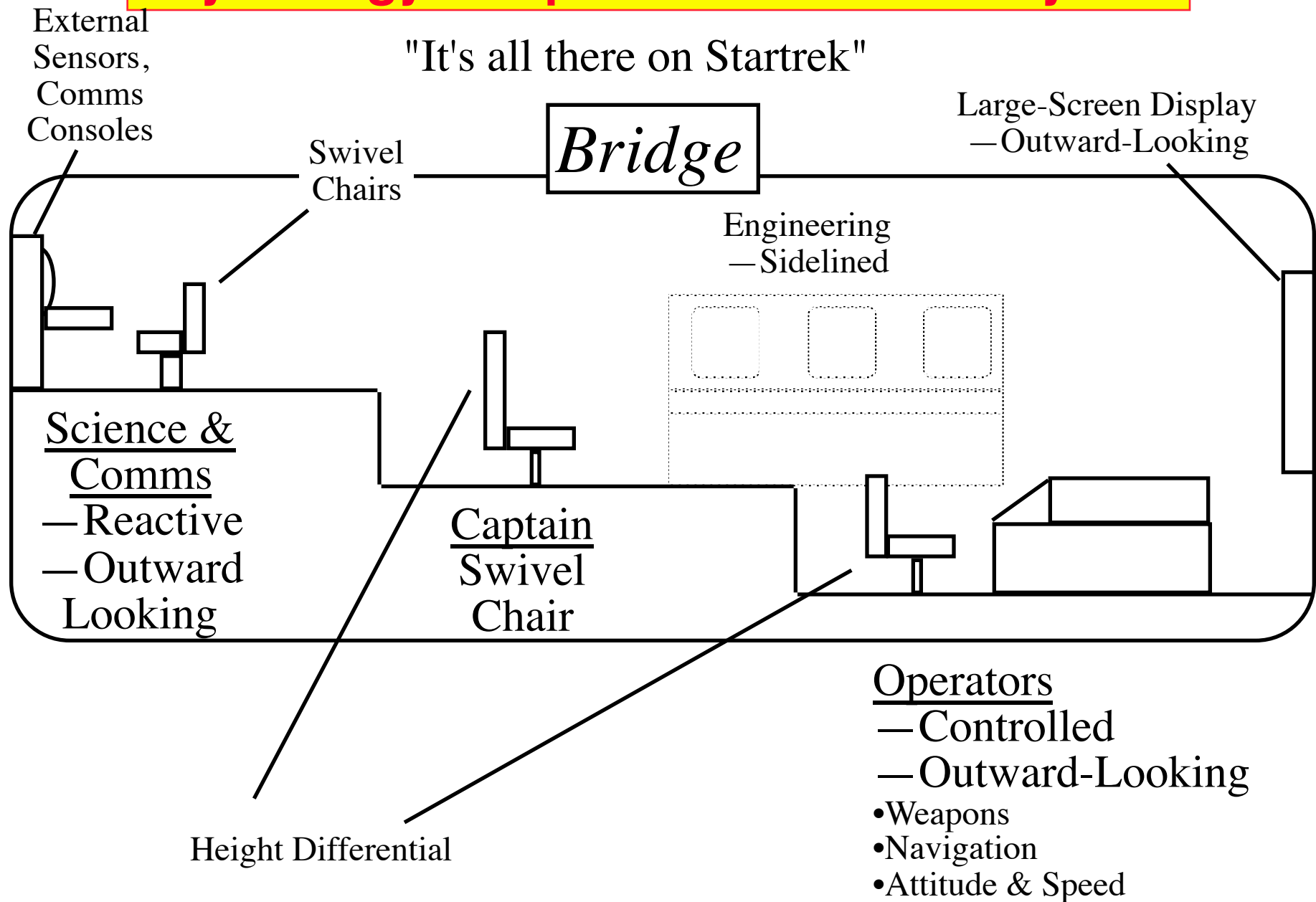
# Human Predictability

- Some view humans as too complex, variable to be predictable—"soft" viewpoint
- Others view the human as an adjunct to the system
  - learn to respond to, and interact with, technology, situation and environment—"hard" viewpoint.
- Neither viewpoint fits observed facts
- Social Psychology and Social Anthropology study behaviour of individuals in society—
  - fruitful avenues of research into the behaviour of humans in social groups, e.g. teams, regiments, etc
- Mutual distrust between engineers and social "anythings"

## Some Human Social Characteristics

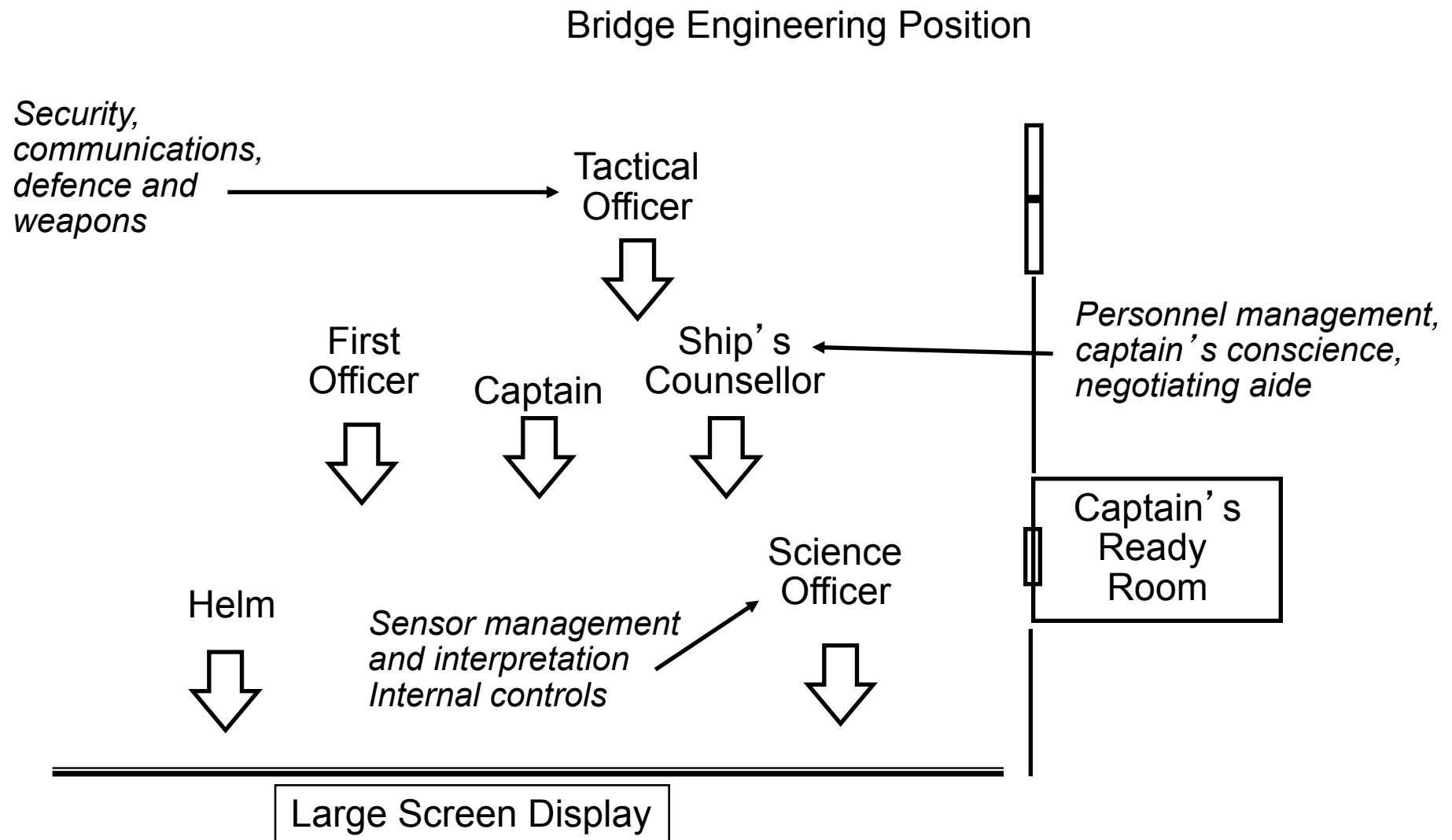
- **Motivation** - inclinations to conform to social norms (Achievement Motivation and Compliance Motivation)
- **Dominance / Submission** - tendency to lead or be led
- **Territorial Imperative** - strong sense of territory ownership
- **Territorial Marking** - visible signs / symbols of ownership
- **Personal Space** - egocentred space, physical and emotional
- **Family Loyalties** - Unquestioning adherence to relationship
- **Tribal Loyalties** - Unquestioning adherence to relationship
- **Dyadic Reciprocity** - Interactions between communicants
- **Natural Pre-disposition** - Inherited tendency to respond
- **Cultural Pre-disposition** - Learned tendency to respond
- **Group Polarisation** - Tendency for group discussions / decisions to move to the extremes—"Risky Shift"

# Psychology of Operations Rooms Layouts

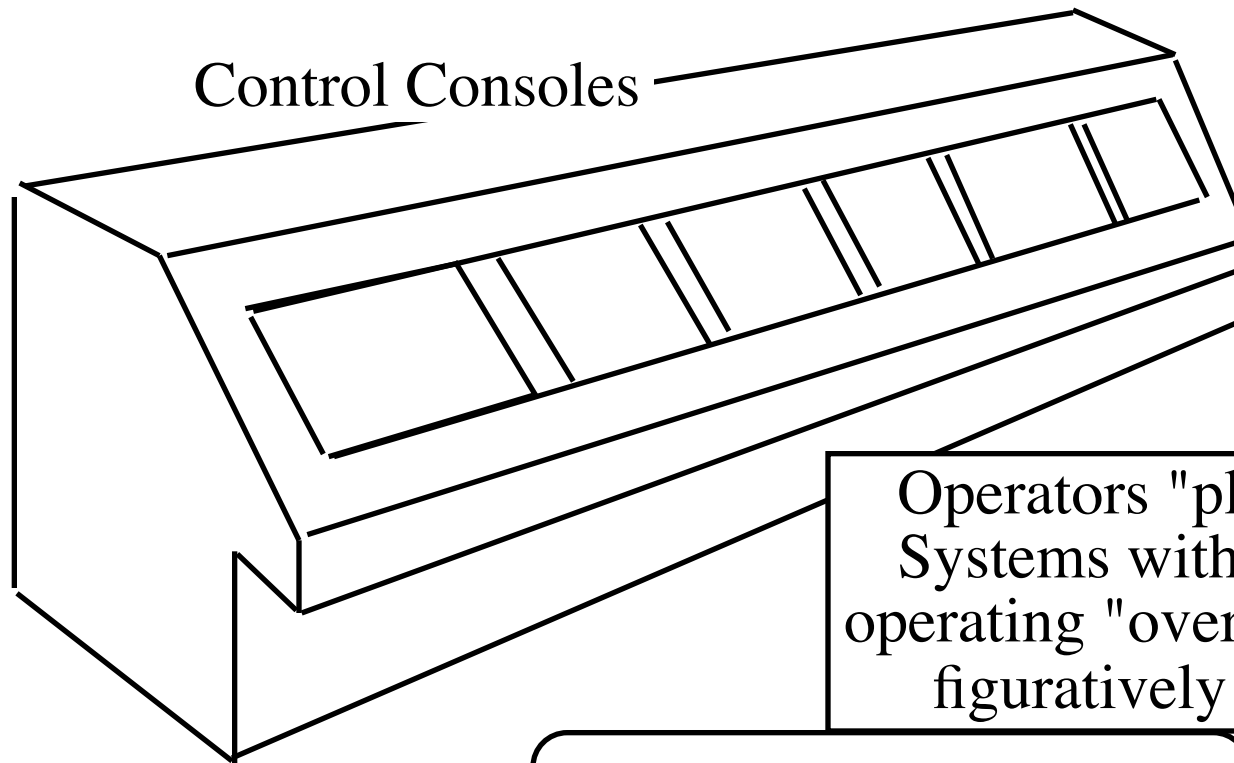




# Startrek—the Next Generation—a new Psychology?



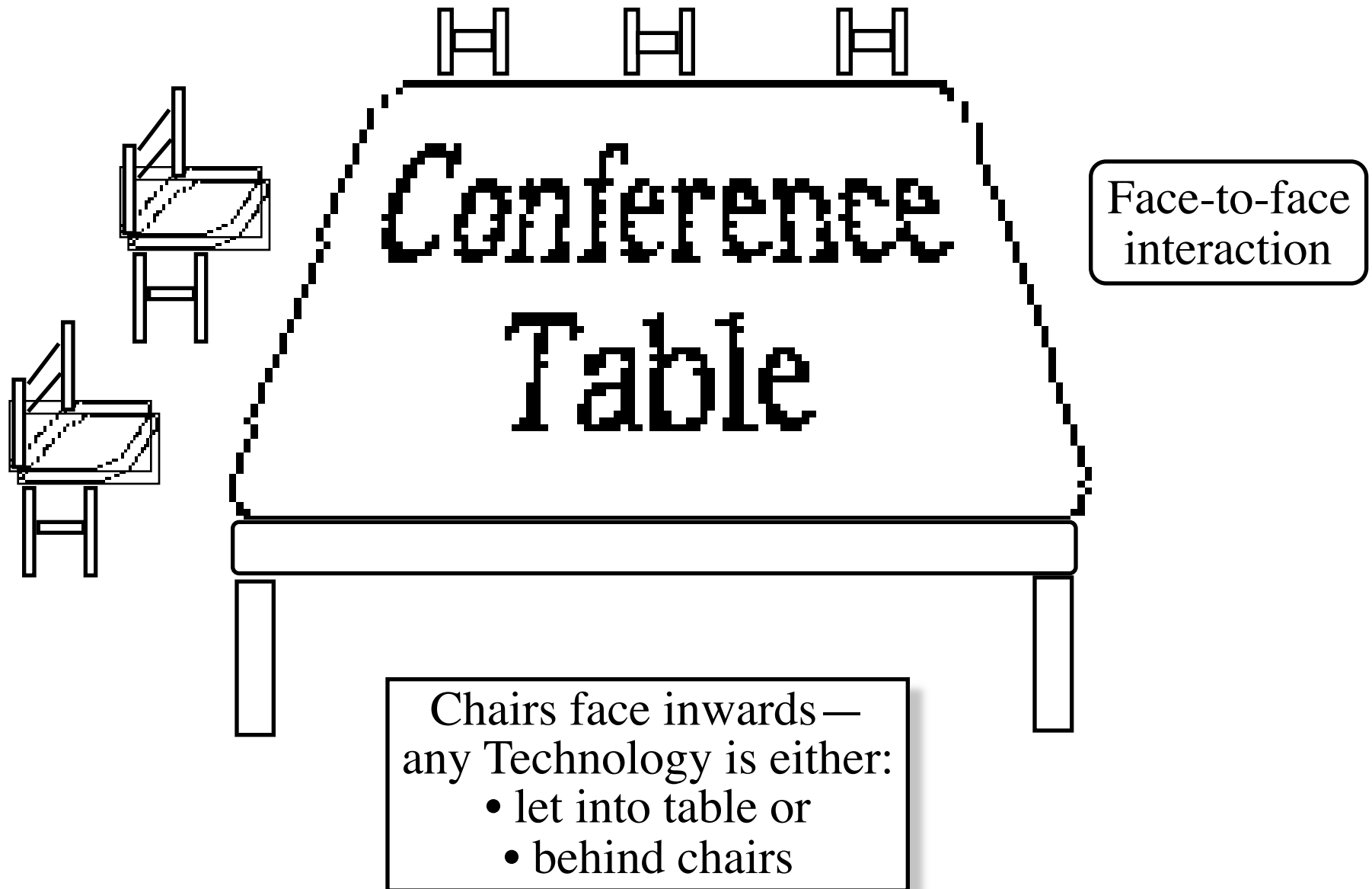
# Real-Time Air Traffic Control



Operators "plugged-in" to Systems with Supervisors operating "over the shoulder", figuratively or in reality

Operators intercommunicate via screens and intercoms

Operators fulfilling role of intelligent machine?



# Warrior/police-centred Concepts

- Information to and from the immediate/front-line user
  - individual in contact with enemy/civilian
  - implies user as information node
    - vehicle/personal location systems
    - personal video cameras, concealed microphones, auto alarms
    - personal displays of image, fax, video
    - individual load limits, power-supply limits
  - compatible with contemporary *auftragstaktik*
- Are our traditional ideas about *control* tenable in this new C<sup>2</sup> environment?
  - Akin to the present rôle of the Police?

## The \$64M Questions

- Social change is moving the C<sup>2</sup> task away from automated, prescriptive rote activities
  - automated C<sup>2</sup> best suited to static defences against fast but predictable enemy
- C<sup>2</sup> in short-to-medium term more human centred?
  - to accommodate patchwork battlefield, peacekeeping, warrior-centred force structures
- Do we understand C<sup>2</sup> psychology sufficiently to:—
  - design-prescribe systems and facilities for unknown situations?
  - or, develop context-free support facilities for universal soldiers?