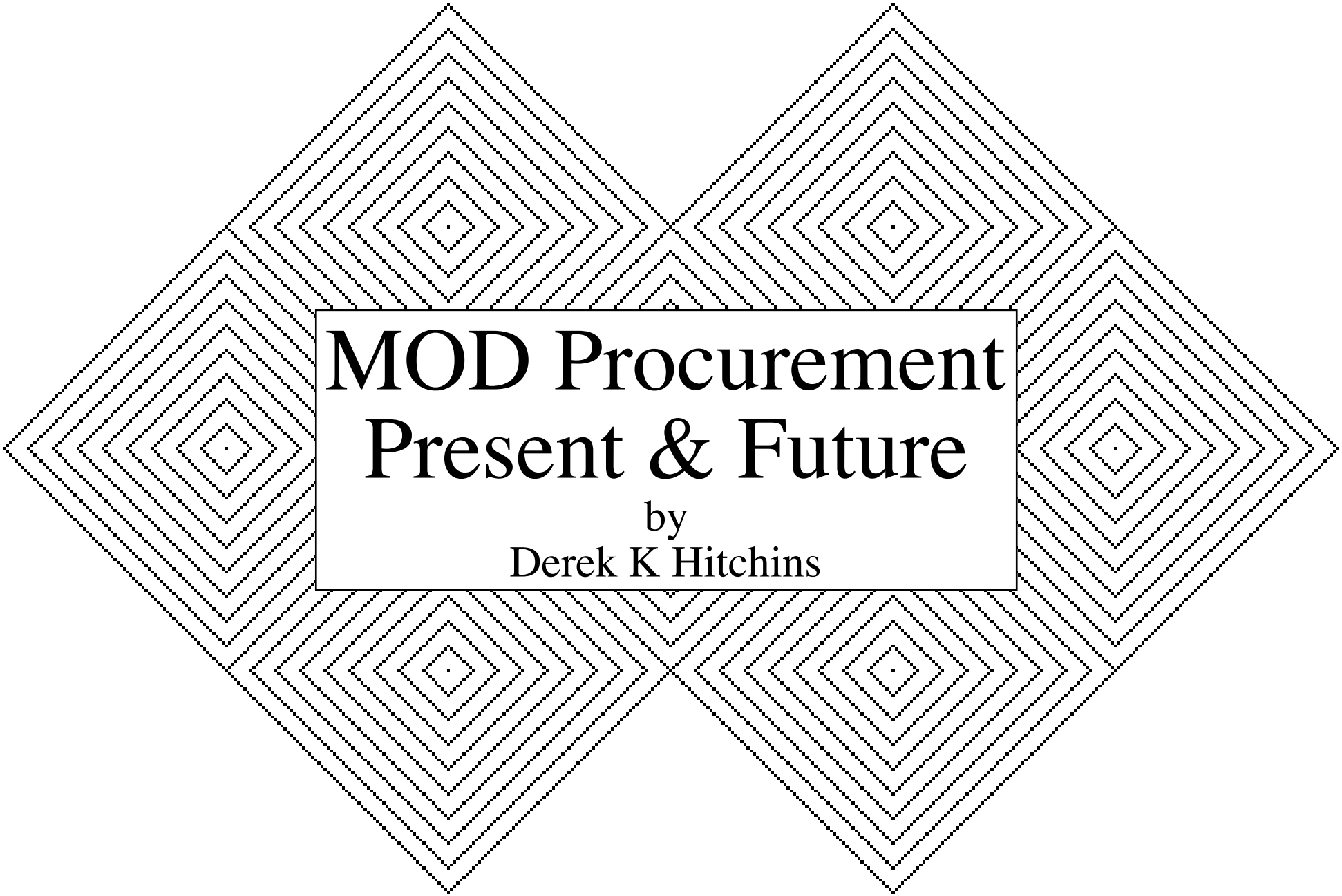


MOD Procurement Present & Future

by

Derek K Hitchins

Part A—The Present Scene

The Debacle—£1,000 M p.a. for 10 years

PROJECT	YEARS LATE	COST OVERRUN(£M)
Foxhunter (Blue Circle)	?	>1,000
Chevaline (Polaris W/H)	?	>1,000
Nimrod AEW	Scrapped	>1,000
EH101 Merlin	5	>322
LAW80 Missile	5	>82
Warrior Personnel Carrier	2	190
BATES	?	+140%
JTIDS	5	£4.3M H/W scrap+200% S/W
RAF TRISTAR (1/2 Batch)	2/5	
	62/27	
ALARM	4	124
T2400 Submarine	2-3	135
Churchill H/K Subs	Decommissioned	400

Upholder Submarine

Financial Times, 16 May 91

- "I do not wish to pretend it was a total success story"...Brian Hawtin, Ass Und Sec (materiel/naval)
- £40M over budget, 3 years late
- Torpedo tubes leak....water enters when torpedoes fired
- Engine stops dead when going from ful ahead to astern
- Major engine collong difficulties
- VSEL Consortium—Torpedo problems were design faults, down to MOD
- MOD—faults in original design by ARE
- MOD seeking £6M damages from GEC-Marconi—manufacturers of submarine diesel-electric propulsion systems
- MOD denies Upholder is incapable as a hunter killer

"IRAQ—5 GR1s Downed in 5 Days"

"US employs Remote Precision-Guided Munitions—
devastating accuracy, v. few aircraft losses"
"Heavy TORNADO GR1 losses to groundfire"
"Bucanneers recalled for Laser-Guided Bomb capability"

So, we spend £18M per GR1 and equip them with close-in weapons, delivery of which endangers aircraft, aircrew and Allied reputation.

Never mind *how* we procure

Do we know *what* to procure?

Something *Fundamentally* Wrong!

"RAF Tendering Spirals out of Control"

Air Defence System overran two years, accepted on reduced spec

Teletype system arrived 10 years (sic!) late

Computerized message system bankrupted manufacturer—project abandoned

"Systems which are complex, specialized and state of the art are high risk whether they be new tanks, the Channel Tunnel, command and control information systems or plain inventory management and control systems"

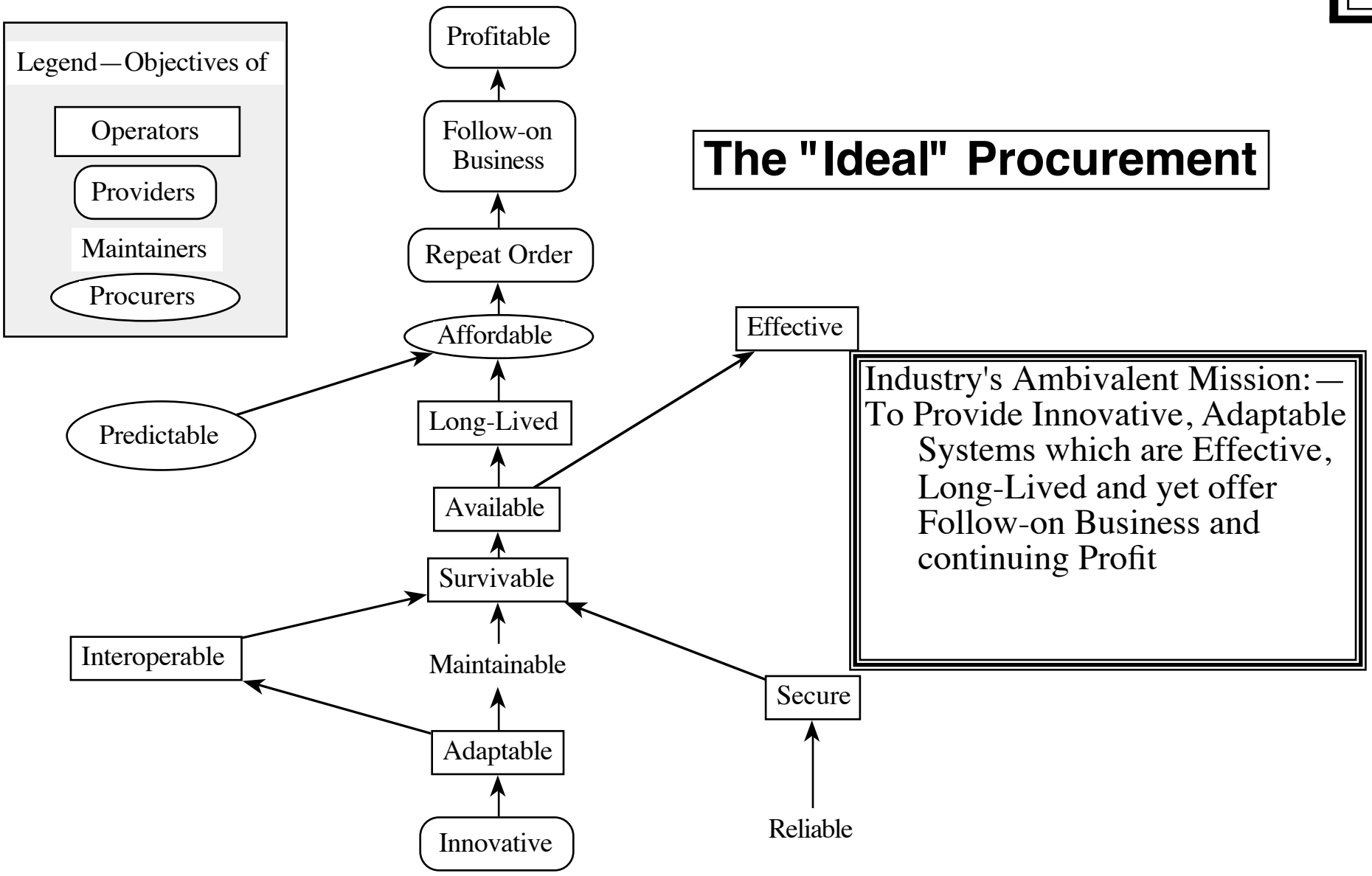
Brigadier W Bewley, Bicester

US DOD "Only 1.5% of systems commissioned were used as delivered..... 47% of systems were delivered but never used"

.....Computing, 15 Nov 1990

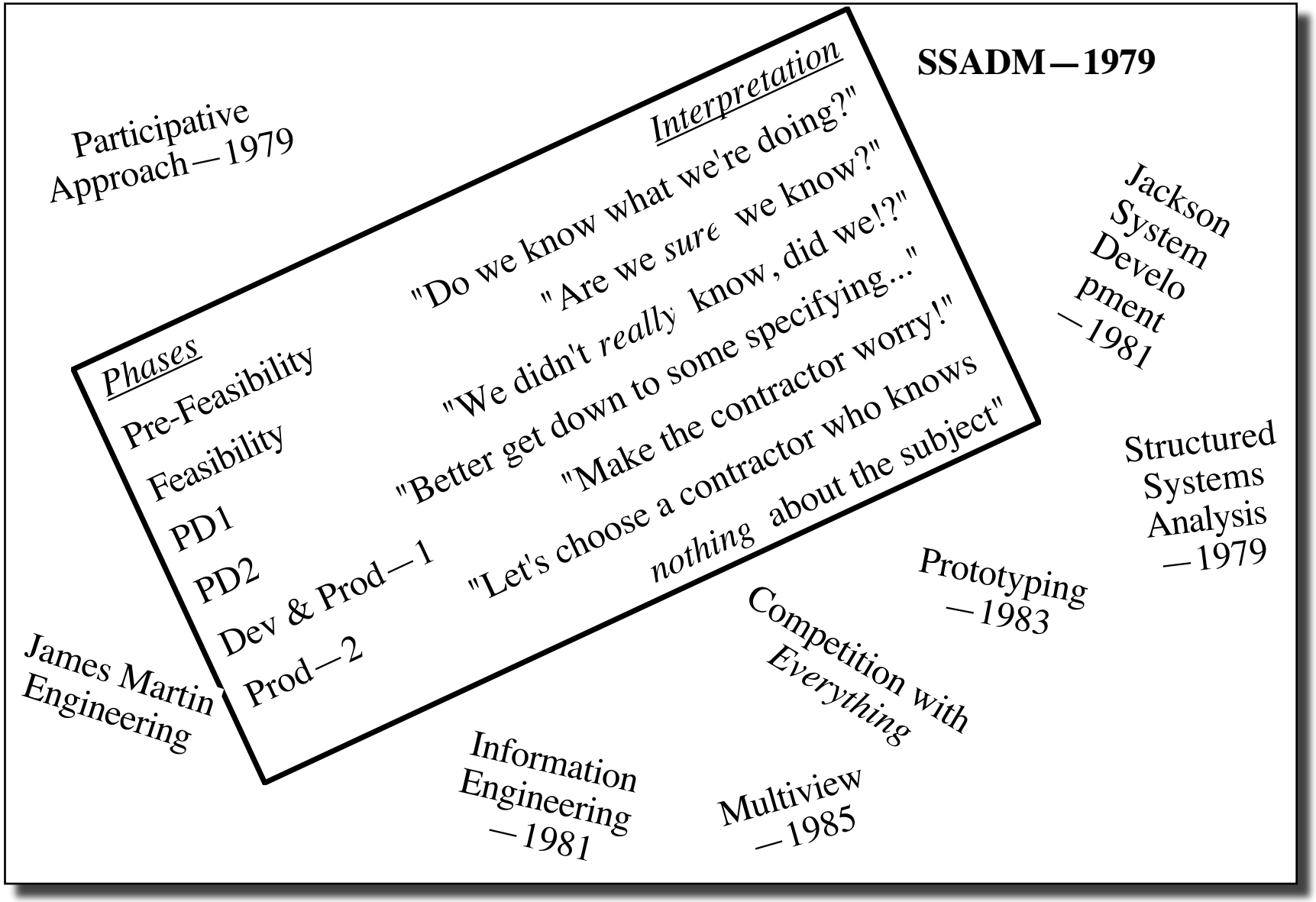
"...due to a messianic faith in high technology", Management Today, 91

The "Ideal" Procurement

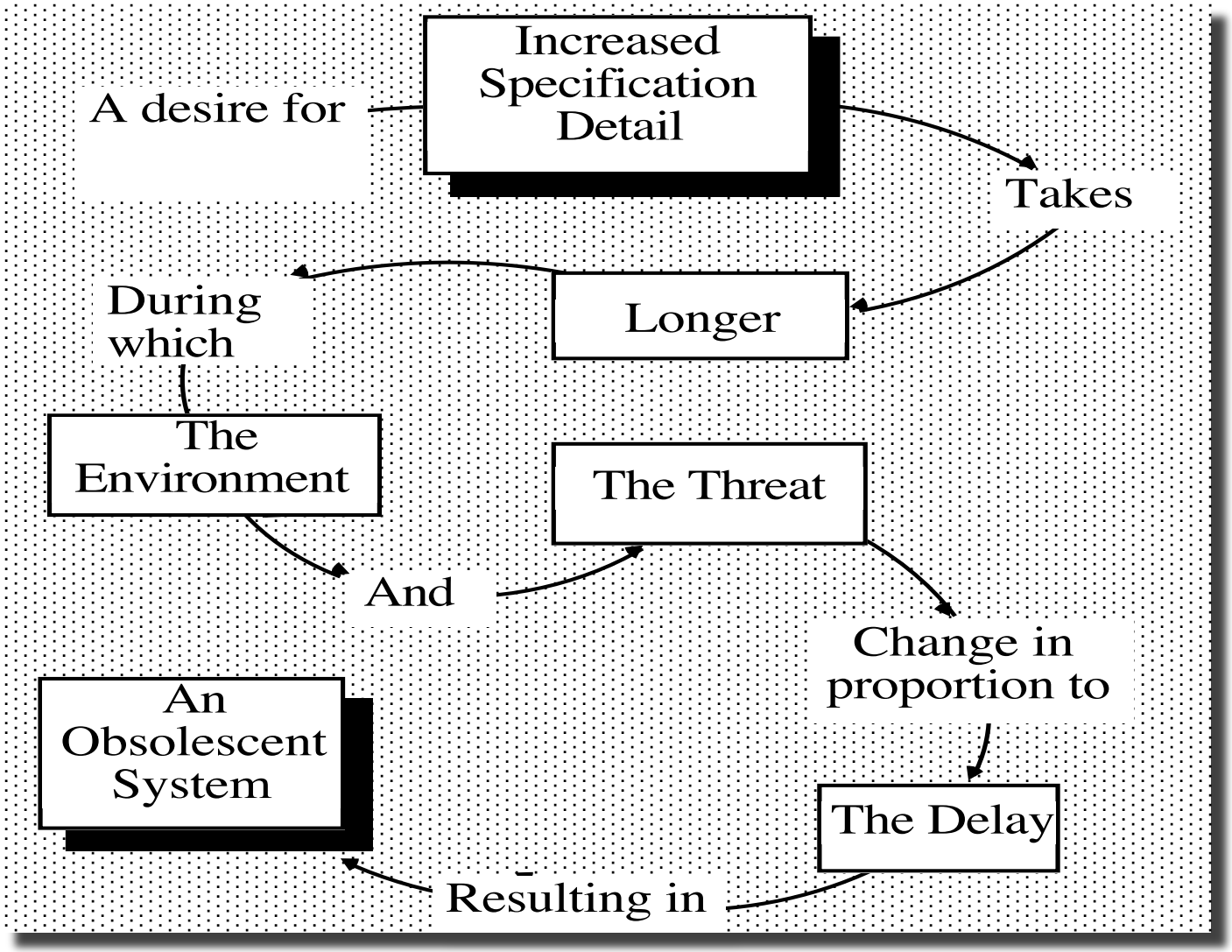


Industry's Ambivalent Mission:—
To Provide Innovative, Adaptable Systems which are Effective, Long-Lived and yet offer Follow-on Business and continuing Profit

Phases and Philosophies—Past and Present



Carefully-Specified Obsolescence



Capturing the Requirement ?

- Knowledge elicitation seeks to draw out from the user his decades of experience:-
  - How much experience is enough? When is the process complete?
  - How relevant is past experience to the future?
  - How much 'elicited knowledge' can be understood only in domain and context?
- Can the requirement be solution -independent ?
- Can OR staffs be competent ?
  - Engineers have seldom engineered in Industry and are - at best - out of technical touch
  - Operators know no Industry-Speak, are naive, do not know what is possible / practicable

Negative Aspects of Fixed Price

- Research-type tasks cannot sensibly be specified
- Antithesis of Systems Approach
- Prejudices Quality, Reliability, Maintainability
- Increases Total Life Cycle Costs (LCC)
- Small organisations undertaking projects beyond their competence
- Increases MOD effort in producing requirement specifications
- Increases effort required by Industry to quantify risk
- Risk greater, therefore target profit greater
- Disagreements over specifications = delays, litigation

Low returns will result in hi-tech companies moving away from the defence industry

ICB Rules

International Competitive Bidding Rules:-

- **"Lowest Compliant Bid Wins"**

- *Compliant* can be subjective or manipulated - (UKAIR CCIS - Pascal vs ADA)
- Tendency at present to reduce rules to :-
  - Lowest Bid Wins
- Tendency only viable due to separation between MOD (the user) and MOD(PE) - the procurer

MOD - the real customer - is the loser

The Lowest Bidder

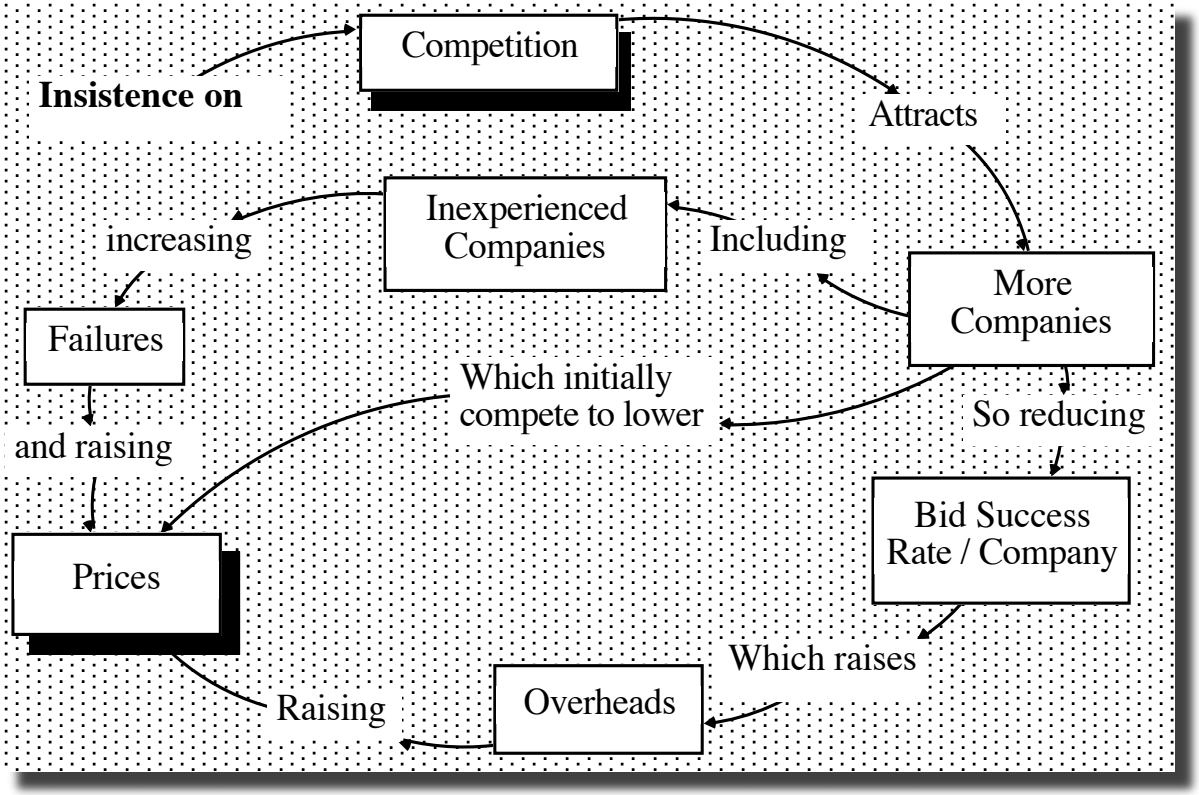
"It's unwise to pay too much, but it's worse still to pay too little. When you pay too much, you lose a little money - that is all. When you pay too little, you sometimes lose everything, because the thing you bought was incapable of doing the thing it was bought to do. The common law of business balance prohibits paying a little and getting a lot - it can't be done. If you deal with the lowest bidder, it is as well to add something for the risk you run. And if you do that, you will have enough to pay for something better.

John Ruskin (1819 - 1900)

"....If a contractor is bidding way below its competitors, alarm bells should ring. He may have seen a lopphole in the tender through which he will drive a cart and horse"

.....Brigadier W Bewley

Competition in Perspective

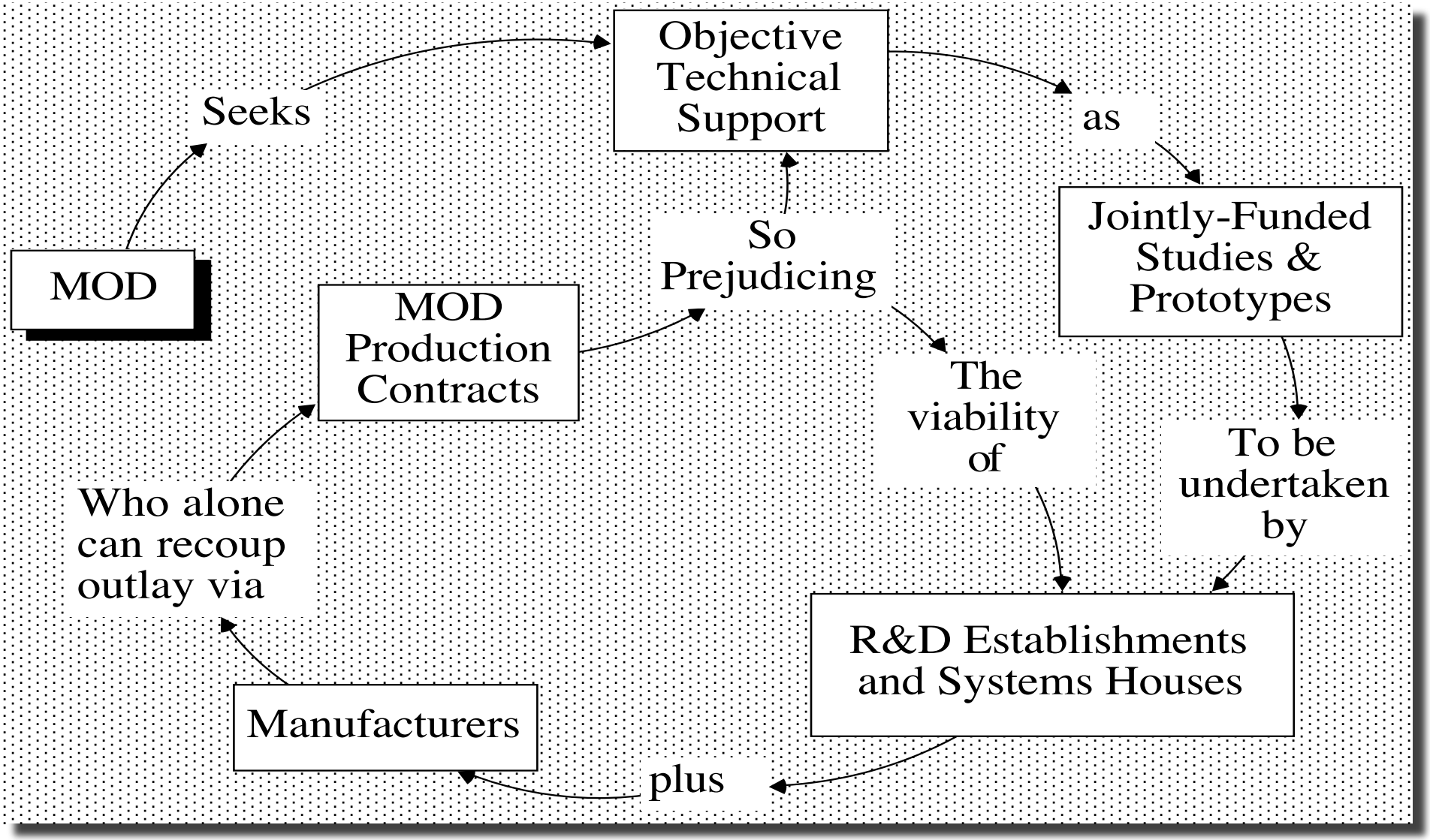


Fair and Unfair Competition

- International competition requires Consortia with European partners
- European governments sponsor individual companies to provide defence products e.g. Siemens and IFF
- Competing British companies find themselves competing for the same European partners to join their respective Consortia.
- The European companies refuse to collaborate until after the competition, then go with the winner.
- R&D is funded heavily funded by some governments, e.g. France and Italy. Their companies can produce much lower bid prices

UK Industry response—combine with European Companies—threatens MOD/MOD(PE)

Objective Procurement Support



Present Out-Turn

Late, costly systems

Precise Specification impossible *and* invoking Rigid Systems

System Architecture complexity burgeoning

Knowledge Elicitation vicarious, imprecise, suspect

Development timescales prejudice predictability

Punishing "late" contractors can be self-defeating

And Now Peace is Trying to Break Out!

Whole Platform Procurement—Authority & Responsibility

Single contractor procures whole platform, fixed price:
EITHER

- Contractor buys systems internationally.
- Contractor seeks lowest cost, soonest availability, minimum performance.
- UK Industry and R&D Establishments compete world-wide for UK platform systems

OR

- MOD imposes preferred UK systems on contractor
- Contractor loses control on time and budget

Two Major Findings:-

- In all major projects one should proceed step-by-step, demonstrate the technology and only commit to full development when clear performance goals and acceptance criteria can be established and made binding on the contractor
- Each major project requires a single professional project manager who has effective control of all relevant resources, including specialist technical support

Are these findings Compatible with separate MOD and MOD(PE)?

Industry & MOD — Intrinsic Differences

Commercial Industry	MOD
• Single motivation-financial • Action Criteria are financial • Success/failure quantifiable (£) • Answerable to shareholders • Able to react rapidly / flexibly • Time is fixed / quantifiable • Organisations tailored to simple objectives and committed • Subject to limited change	• Motivation more complex • Criteria are more complex • Ultimate proof in conflict ? • Subject to public scrutiny • Lengthy approval process • Time targets less certain • Organisation not structured for success in these terms • Accommodates greater Change

Learning from Industry

Industry does:-

- Place precise / definitive prime contracts
- Have ability to intervene via high level visibility
- Compare own information with that provided by contractor
- Appoint project manager directly supported by own monitoring staff / tools
- *Collaborate* closely Prime + Subs
- Bury mistakes, provide "new, improved (i.e. more expensive) version"

MOD/MOD(PE) lacks:—

- Skills — designers, experienced businessmen, commercial experts
- Resources to police procurement effectively

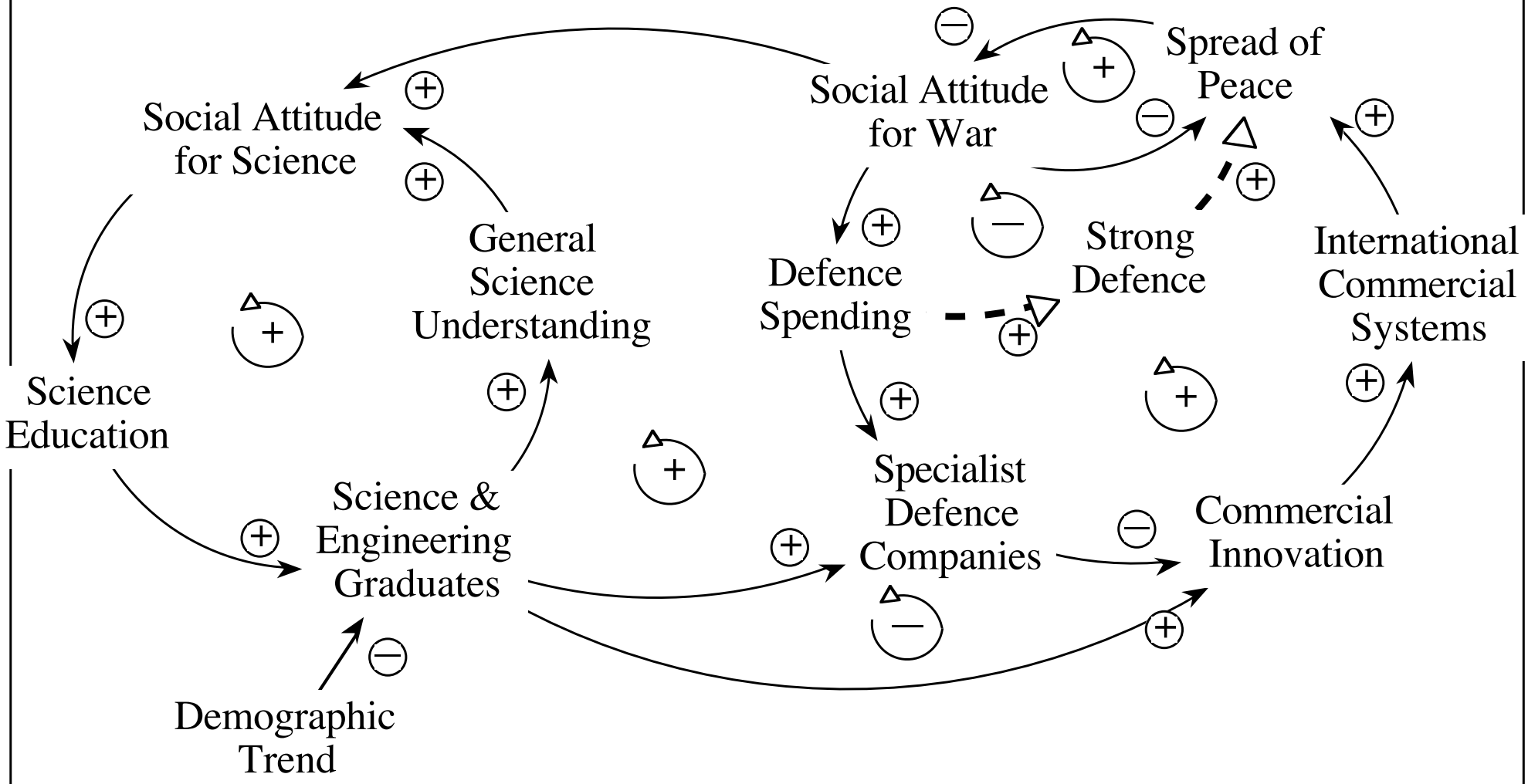
Part B—Looking Afresh

1. The Changing Military Need
2. The Need for Adaptability
3. Avoiding the Technological Truss

"Small is Beautiful" Influences

- *Cost of Complexity, square-law growth of Infrastructure*
  - Illusory Economy of Scale
  - *Spend on Weapons >> Spend on C2 / ADP*
- Out of Area Role = Transportable, Quick Reaction, Mid-Tech.
- *Survivability—Small & Mobile = Hard to Find, Hard to Hit*
  - New Management Perspective:—
    - —Teams, not hierarchies
    - —Small is agile, responsive
    - —Semi-autonomous = viable, robust, economical
- Outbreak of Peace➔ Reduced Major NATO Project Spend

The Peace Dividend?



A Fresh Look at the Problem

Do we *really* understand how Systems Interact?

How about *Human* Strengths and Weaknesses?

Can Technology resolve essentially-Human Issues?

If it's all so difficult, can we proceed at all?

Open vs Closed

- All systems are Open:—
  - —Clock absorbs energy, emits information, wears out
  - —Humans *are* what they eat
- Open Systems Anabolize, Metabolize, Catabolize

∴ Open Systems adapt, evolve with changing Environment

- Engineers design Closed Systems:—
  - —Closed System = Fixed System = Fixed Price ≠ Open System
- Information System focused on *human*:—
  - —Adaptive
  - —5 / 6 mutually interactive senses = v. high B/W
  - —Subjective

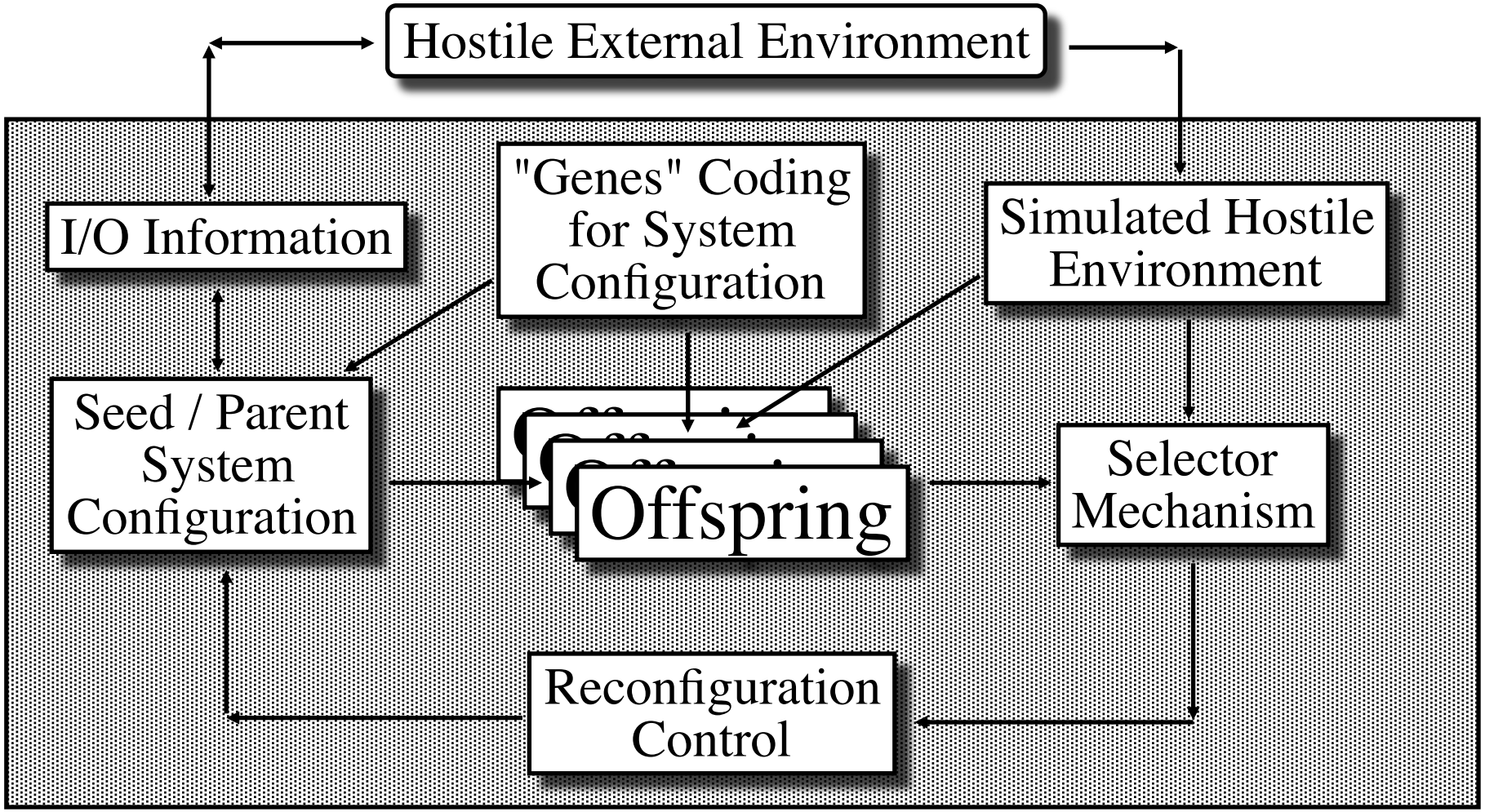
The Principle of Interacting Systems

- If a set of Interacting Systems is in equilibrium and either a new system is introduced, or a change occurs to an existing system or interflow, then—insofar as they are able—the other members of the set will rearrange themselves so as to oppose the change

Rail Fare Rise

City

A Generic, *On-Line*, Self-Adapting System



"CAREFULLY-SPECIFIED *ADAPTABILITY !*"

The Essence of the Information System Design Problem

We don't understand how:—

- Individuals grasp information presented on screens, e.g. 3-D from PPI, fused data display dynamics
- Individuals make decisions—*we certainly don't review all the options when under pressure*
- *Groups* make decisions—e.g. "risky shift", group polarization—or about team cohesion and spirit

In spite of all this, we place our faith in technology to support decision-making under stress

An Alternative Procurement Philosophy

Who knows what they want to do?—The User
Who has all the experience at doing it?—the User
Who should be developing C2 and Management Systems?

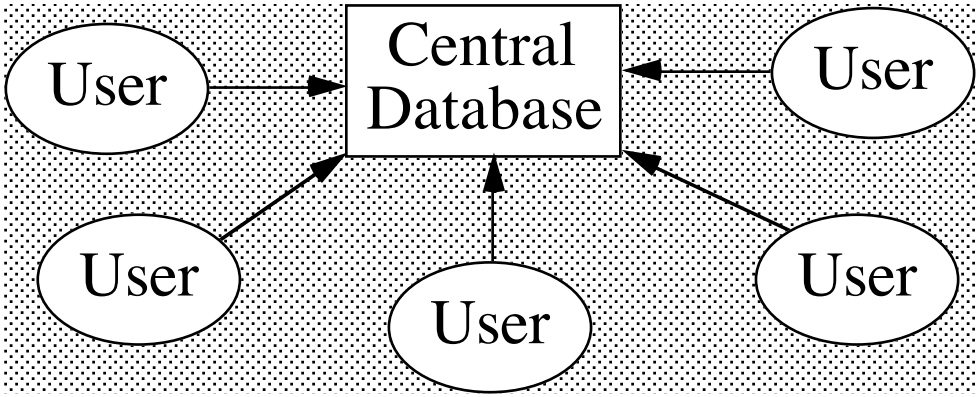
—the Expert User

Robust Command Systems

- There is no job so mundane that it lacks a 'wrinkle'. Humans are past masters at finding easier / better ways to do anything
- Experienced Command system operators have already learned many wrinkles as individuals, *but also as teams*
- Requirements capture is therefore virtually impossible by our present methods—e.g. talking to individuals, building fast prototypes.

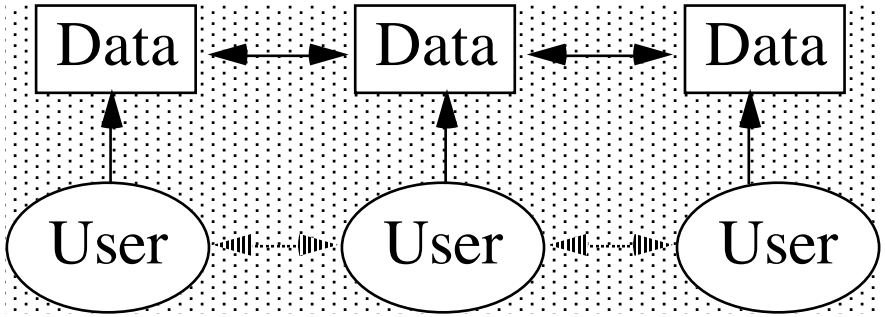
Rule 1. Use expert Command system operators to capture their ***own*** requirements

Information System Paradigms



"Deus ex Machina"

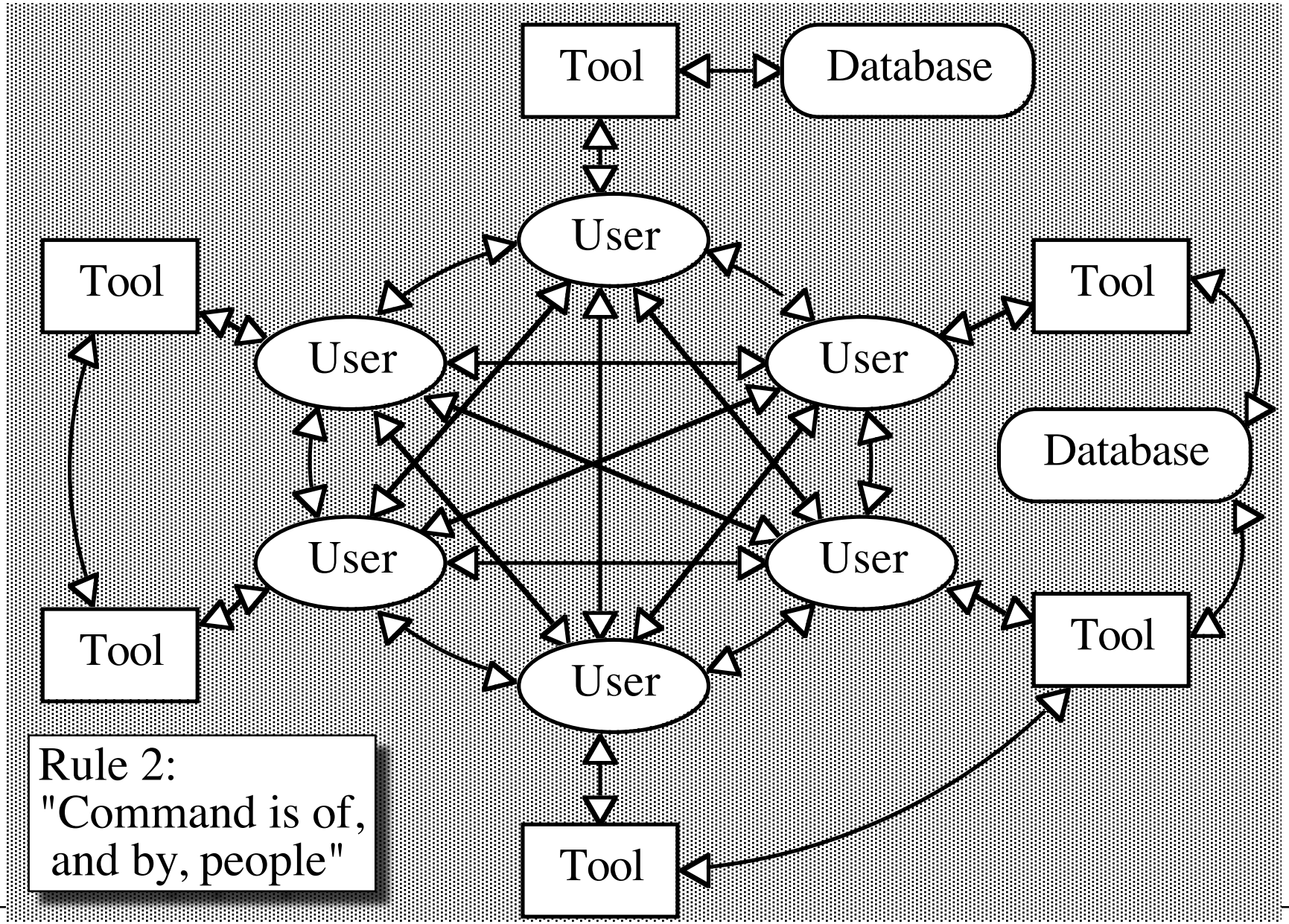
Users communicate via rigid, limited database, using only one of five senses—slow, ineffective, non-adaptive, humans as machine-minders



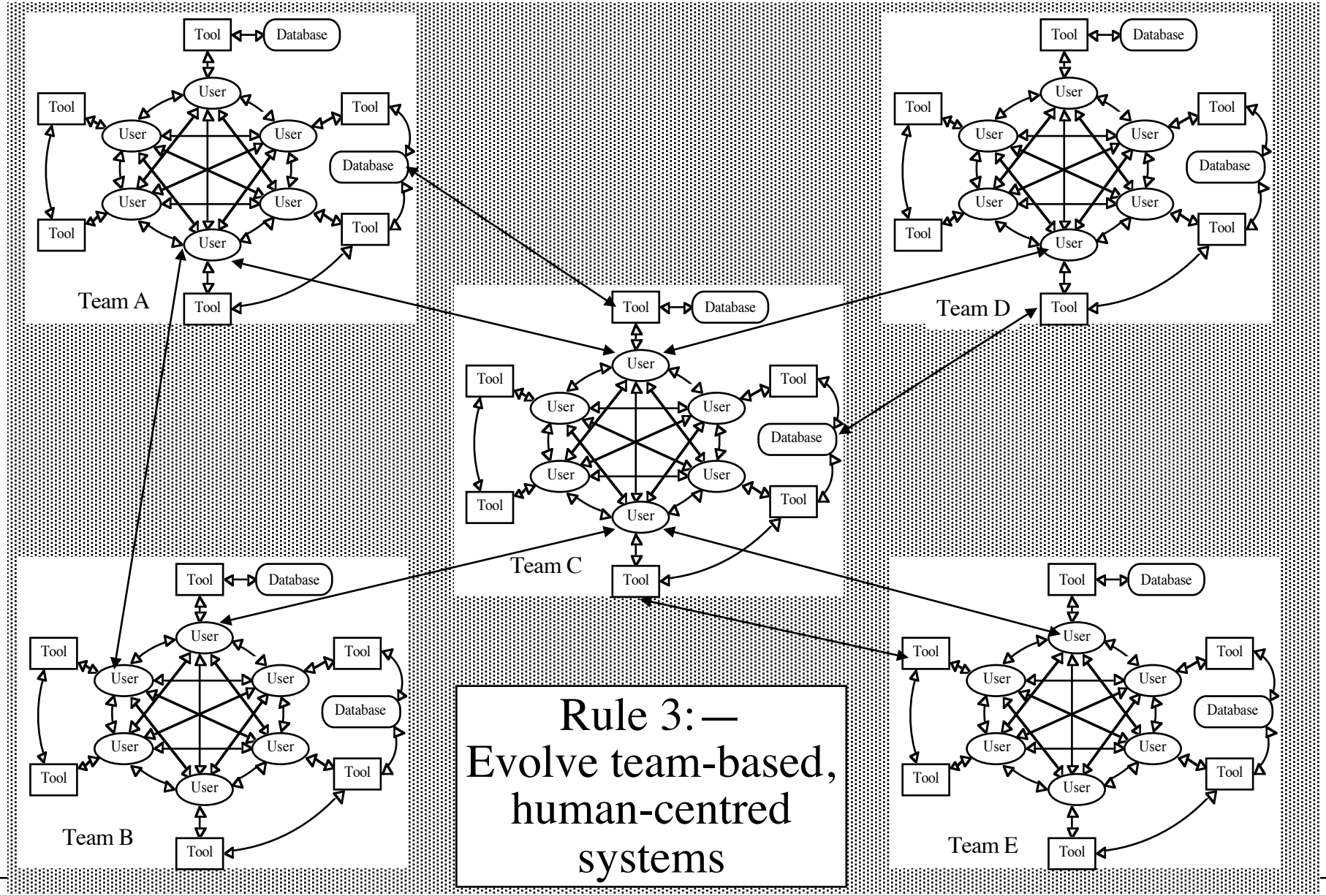
"Users Good—Machines Better"

Users communicate directly *and* via machine; humans adapt, machines do not. Machine quickly obsolescent.

Human-Centred Paradigm



Team-based Command and Information Technology



Rule 3:—
Evolve team-based, human-centred systems

Accelerated Evolution Approach—AEA(1)

Step 1. Eliminate as much technology as possible—create a *human* Command System Team of current experts which uses manual methods.

Step 2. Give the Team *time* to build its repertoire of individual and group skills, interpersonal relationships, group effectiveness. Use extra manpower to achieve performance.

Step 3. *Stress* the Team—simulated Command, cooperation with other force elements, real drudgery, simultaneous representative variety. External DS to be experts, too. Continue until manual team is highly proficient

Accelerated Evolution Approach—AEA(2)

Step 4. *Team* identifies Sub-Teams, bottle-necks, areas for improvement—i.e. the Team proposes its own productivity enhancement, individual-by-individual, sub-team-by-sub-team, absolute minimal technology *integration*

Step 5. Provide the Team with its proposed support

Step 6. Repeat steps 2 to 4

Step 7. Resist the temptation to integrate all the technological support features—that's the path to software overruns, project delays and inflexible technological 'solutions'

The AEA System

- Conceived and evolved by current experts for experts
- User-effort directed at System Performance, not at overcoming technology limitations
- Guaranteed outcome:—
  - —evolves from a manual system (=working system)
  - —degree of evolution controllable (= time/cost controlled)
- Self validating design—user-specified, situation-evolved
- Emergent-property directed—performance, interoperable, flexible, adaptable, damage tolerant (non-nodal)
- Inherent team training
- Avoids "integrate / automate" trap = reduced complement, but:
  - increases maintenance • increases cost • reduces adaptability
  - causes near-term obsolescence.

Understanding—the Bottom Line

1. Understand our own *superb human capabilities*
   - —communication, cooperation, correlation, commitment, courage, intellect, ingenuity (C5I2?)
   - —adaptability
   - —mental-modelling
   - —fast individual decision-taking/satisficing
2. Understand our *human frailties*
   - —decision-information overload
   - —slower group dynamics
3. Use technology to *compensate* for our *weaknesses*
4. *Avoid* technology which *impairs* our individual and group *strengths*