Systems Thinking for Design

Session 3

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, DESIGN AND MANUFACTURING, KANCHEEPURAM

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Session outline

- Group Formation
- Collective Problem Discovery
- Introduction to Systems Theory

Identifying interesting problems

- From deep reflection into our own everyday experience … Problems that have personally bothered you, issues that you are passionate about, where you feel compelled to change the status quo

- From an understanding of the issues/challenges faced by specific category of people/organizations … gleaned through personal observation and various information sources (newspapers, websites)

- From the literature (academically researched papers)

Suggested boundaries

- Issues should be relevant to our context – local and your experience
- Restricted to industries in the manufacturing sector, preferably automotive, aerospace, construction, consumer electronics, defence, electrical equipment, machine tools, medical devices, transportation
- Possible to grapple with your current knowledge base + some stretch
- Potential for a technology-enabled solution (not policy prescriptions) … preferably cyber-physical and affordable solutions
- Revisit your problem statement (5 min)

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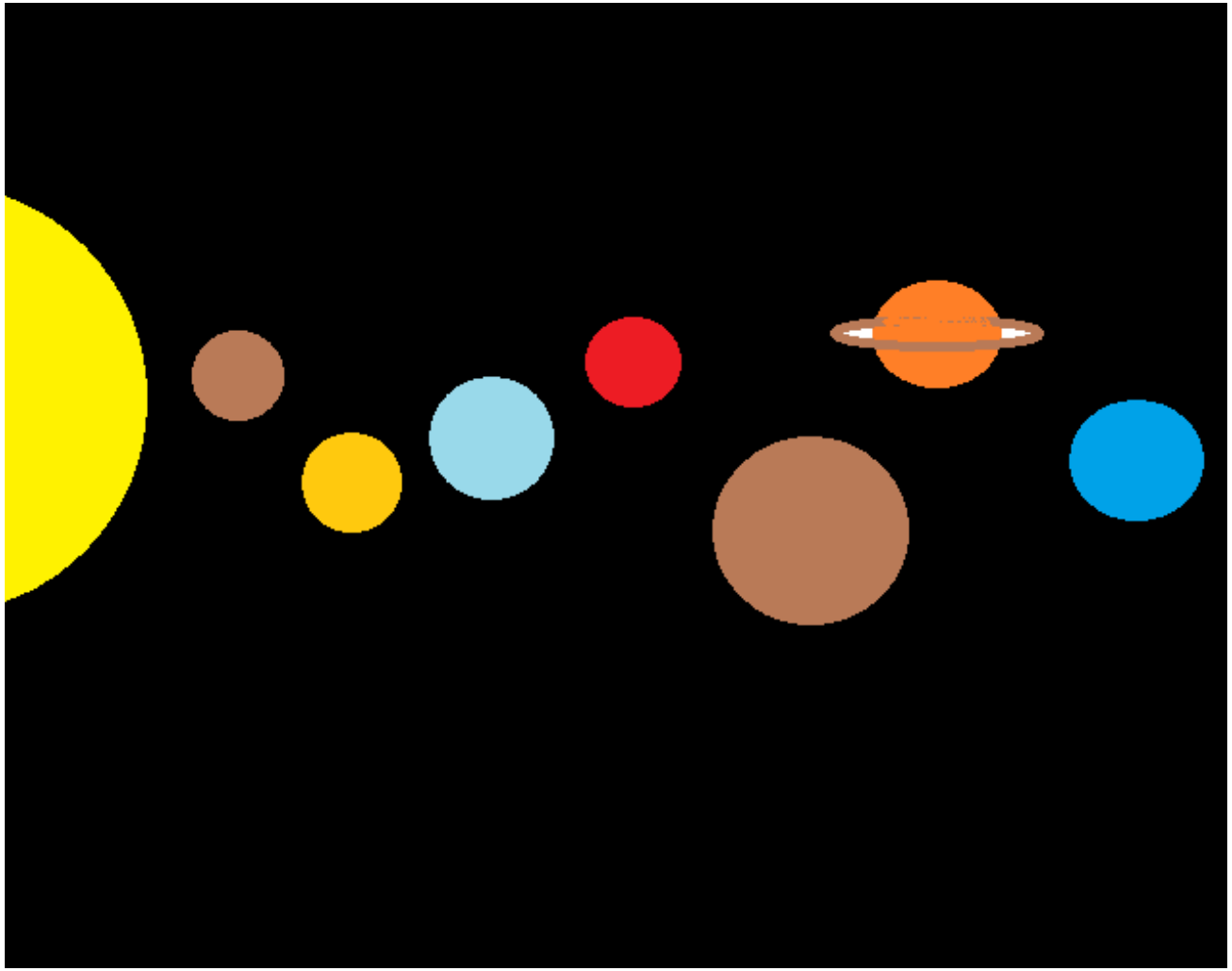
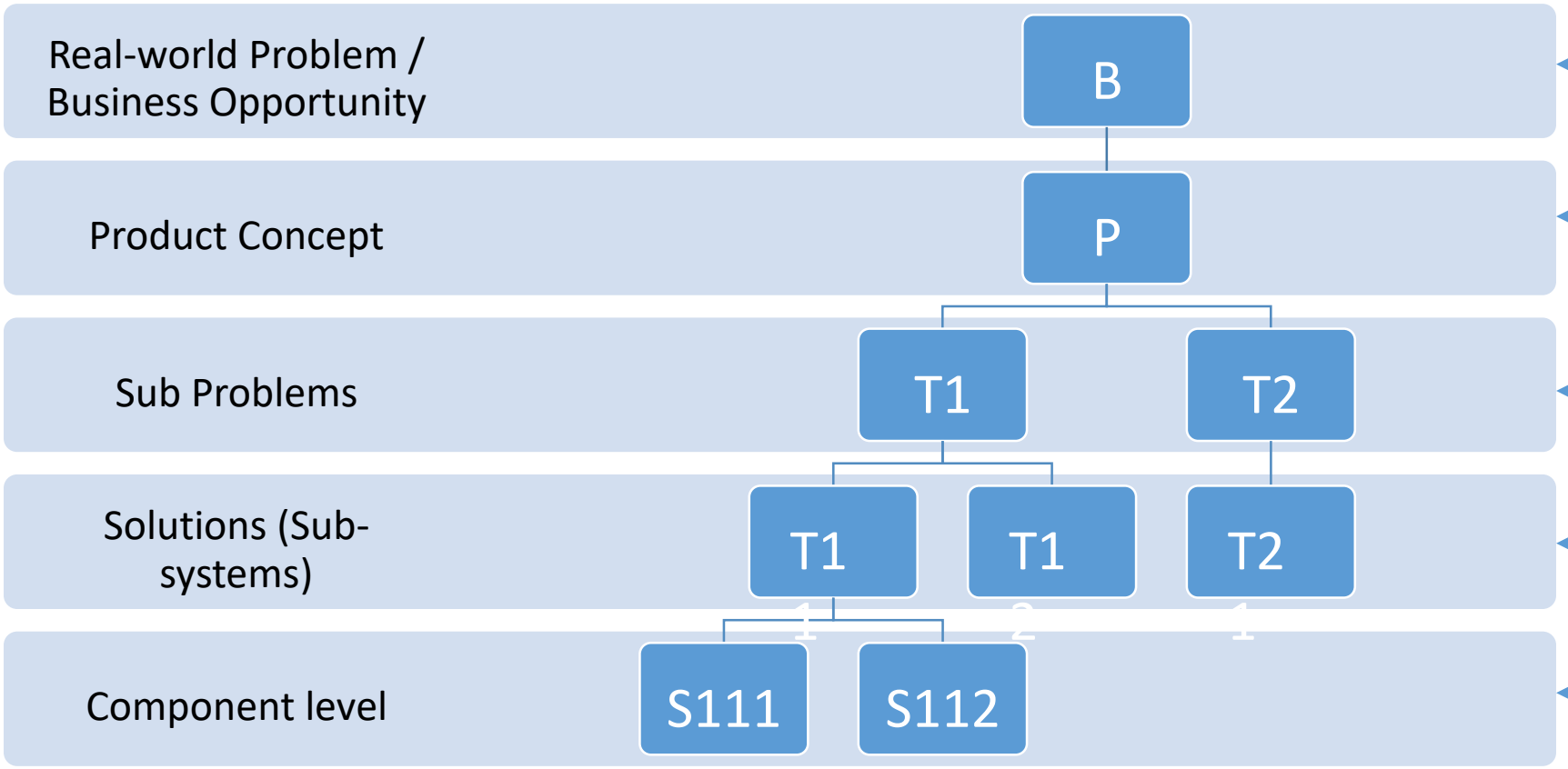
Exercise 3.1 (start now, to be completed before next session)

- As a group discuss and identify the common problem of interest and describe the various facets of the problem…
- Make a start now and complete the research over the week. You can divide the research areas amongst yourselves. Research sources can be
  - Your direct observations of people/activities & interviews
  - Supported by a summary of the latest thinking on the problem
  - Pls refer to e-Library, Google Scholar and other reliable sources
- After research each group member should prepare a 2-3 page summary of the issues as understood by him/her. Ensure there is no duplication of topics. The content should be structured in a logical manner, either timeline or type of issue.
- The base material should be available for discussion in next class

Systems Concepts



Map your problem / idea against this and find gaps



Business opportunity? (Social/Economic issues)

User need? Unstated/Unmet?

Multi-disciplinary Technology problem/soln? (Efficiency/scalability /precision?)

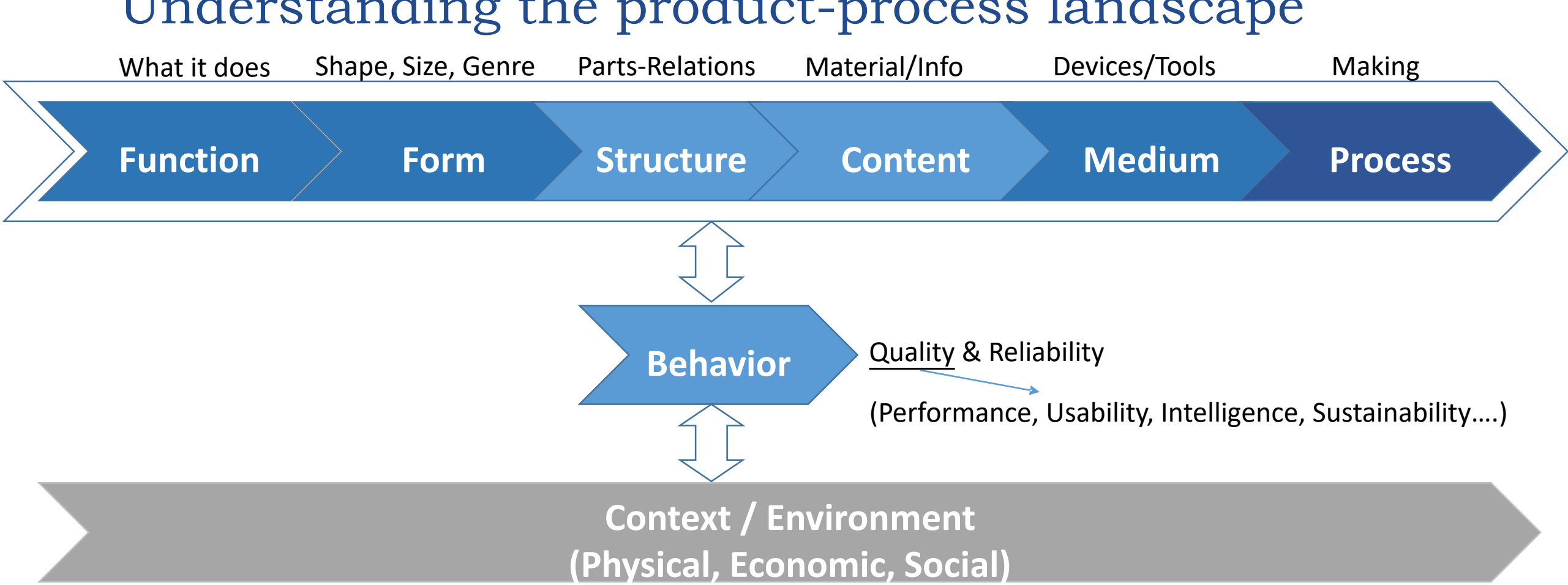
Technical problem / solution-disciplinary (ex: thermal system/Cloud)

Scientific principle? (Physics/Biology)

Case study

Termite attack on wood

Understanding the product-process landscape



Behaviour emerges from the pattern that integrates multiple dimensions

Elements of a Product (a Design)	Car	Ola App	Music
Context or Environment	Geography (Climate, Terrain) Road Condition User segment	Location, network reach, signal strength	Auditorium (acoustics, noise, seating, air conditioning…), audience (age group, gender, etc)
Purpose / Function	Personal Transportation and sub-functions – energy conversion, speed control, rotary motion to linear motion, braking, etc.	Just in Time Mobility, and sub-functions ~~r~~egister, find location, find vehicle, compare costs, etc.	Entertainment and sub-functions… play, record, transfer etc.
Form	Sedan, SUV, MPV	Mobile app or Web App	Classical, Rock, Rap
Structure	Subsystems like Engine, chassis, transmission, electricals, ECUs, # of doors, seats and their arrangement	Technical architecture – software modules/components – database, GUI, hardware, cloud, etc.	Raga (different arrangement of notes)
Content	Aluminum, steel, plastics, glass, fuel type, driver, etc.	Information content – what is collected, given	Words used, Artists
Medium	Not applicable	Smart Phone, specific S/W technologies ~~o~~racle database etc.	Instruments: Violin, Tabla, CD, Radio, Internet
Process	Lean Manufacturing	Agile	Actual performance
Behavior	Performance, comfort, mileage, pollution, noise...	User experience, avg time to get a cab, cab utilization	Overall experience, change in emotions of audience

Innovation, Design and System… (n)

- All three terms are extensively used across different disciplines and organizations (profit and non-profit), and in a variety of ways
- Write down your definitions of these terms and the likely connection among these

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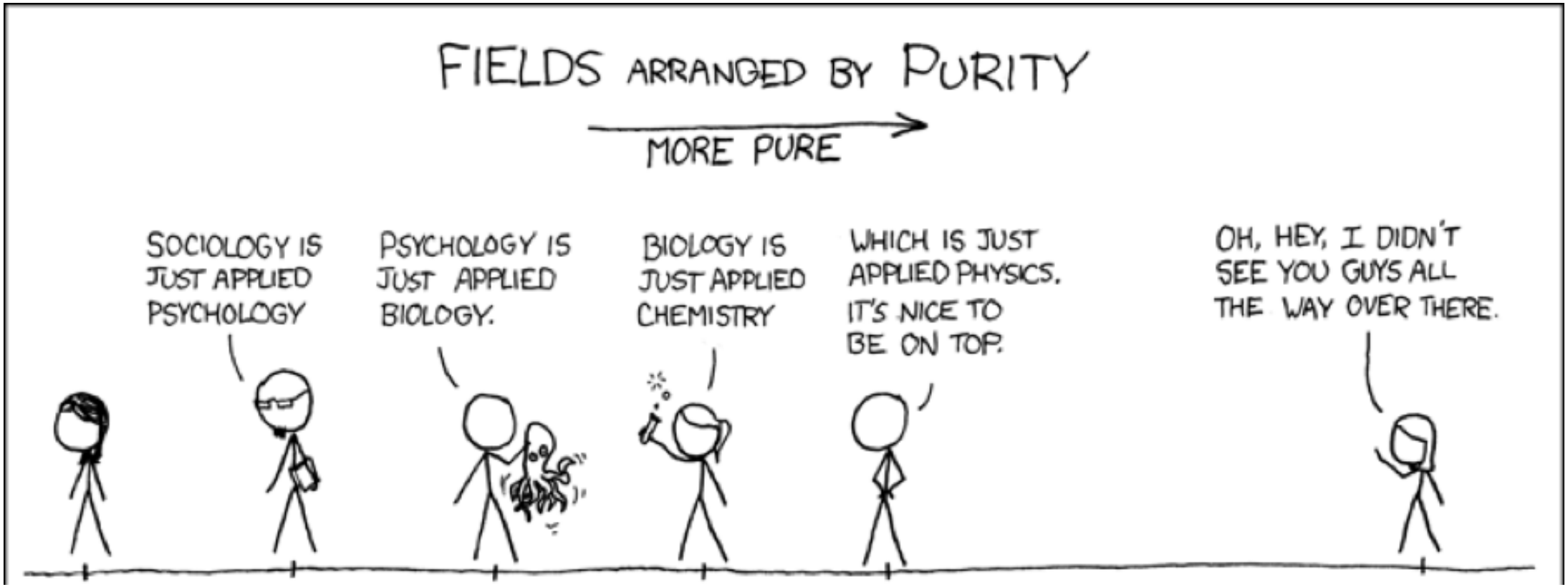
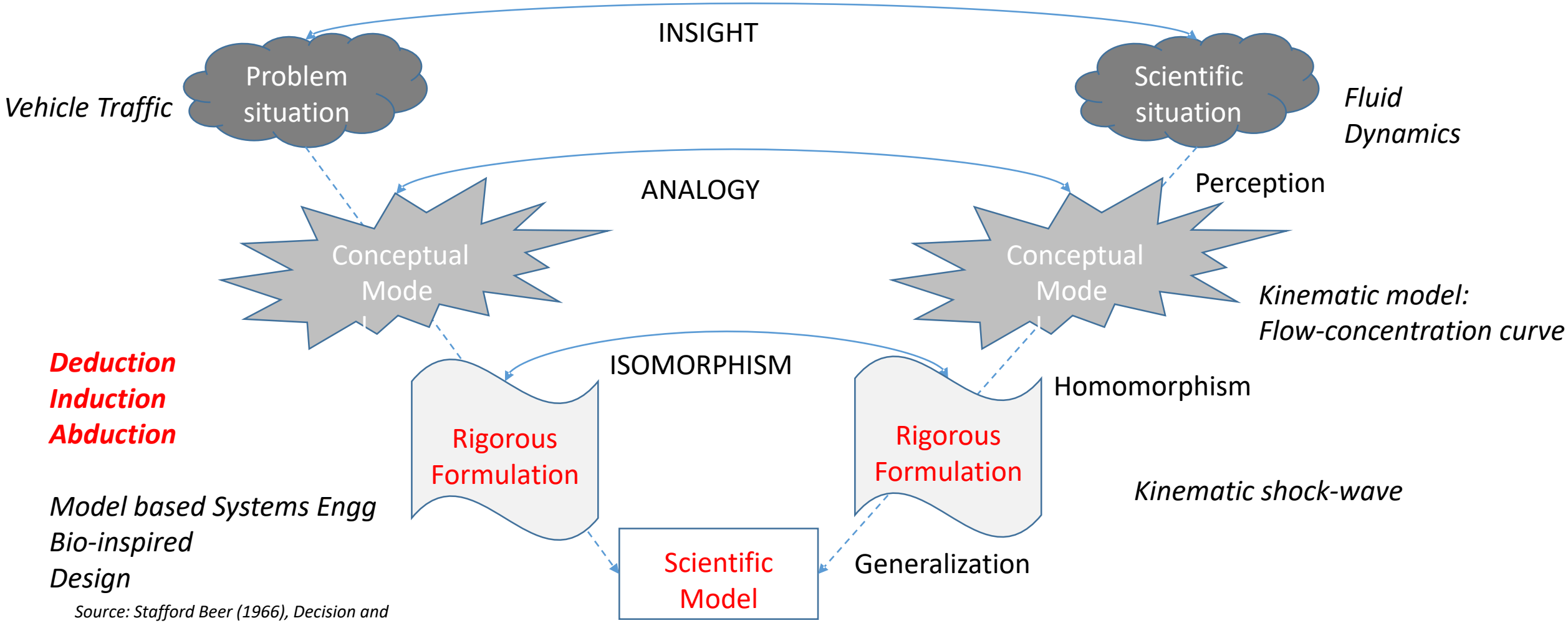


Source: Internet

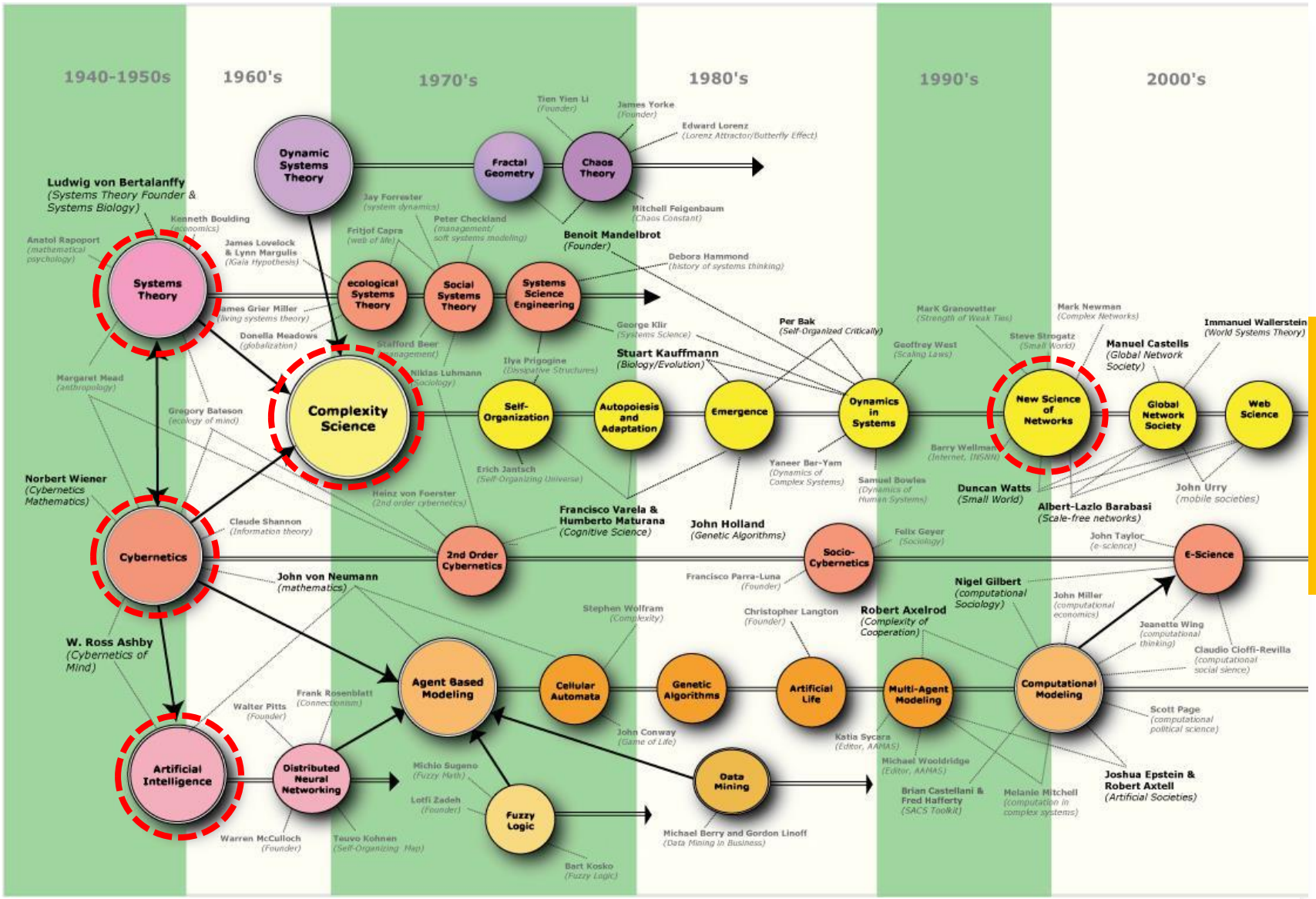
Inter-disciplinary approach to problems

- The problem of reductionist thinking … limited/narrow disciplinary view
- The challenge of integrating disciplinary concepts … incommensurability
- Dealing with socio-technical problems … in search of common language

Fundamentals of Inter-disciplinary approach



Source: Stafford Beer (1966), Decision and Control



Advances in inter-disciplinary theories