CSER 2006 – Conference on Systems Engineering Research

Formal System Concepts

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Overview

System and Meta-System Applications

- Functional & Contruction Rules in Design & Discovery (Simpson & Simpson)
- An Applied Science to Solve Complex Problems (Hall)
- System Complexity Management & Control (Warfield)

Sequential Forms

- Moore
- Wymore

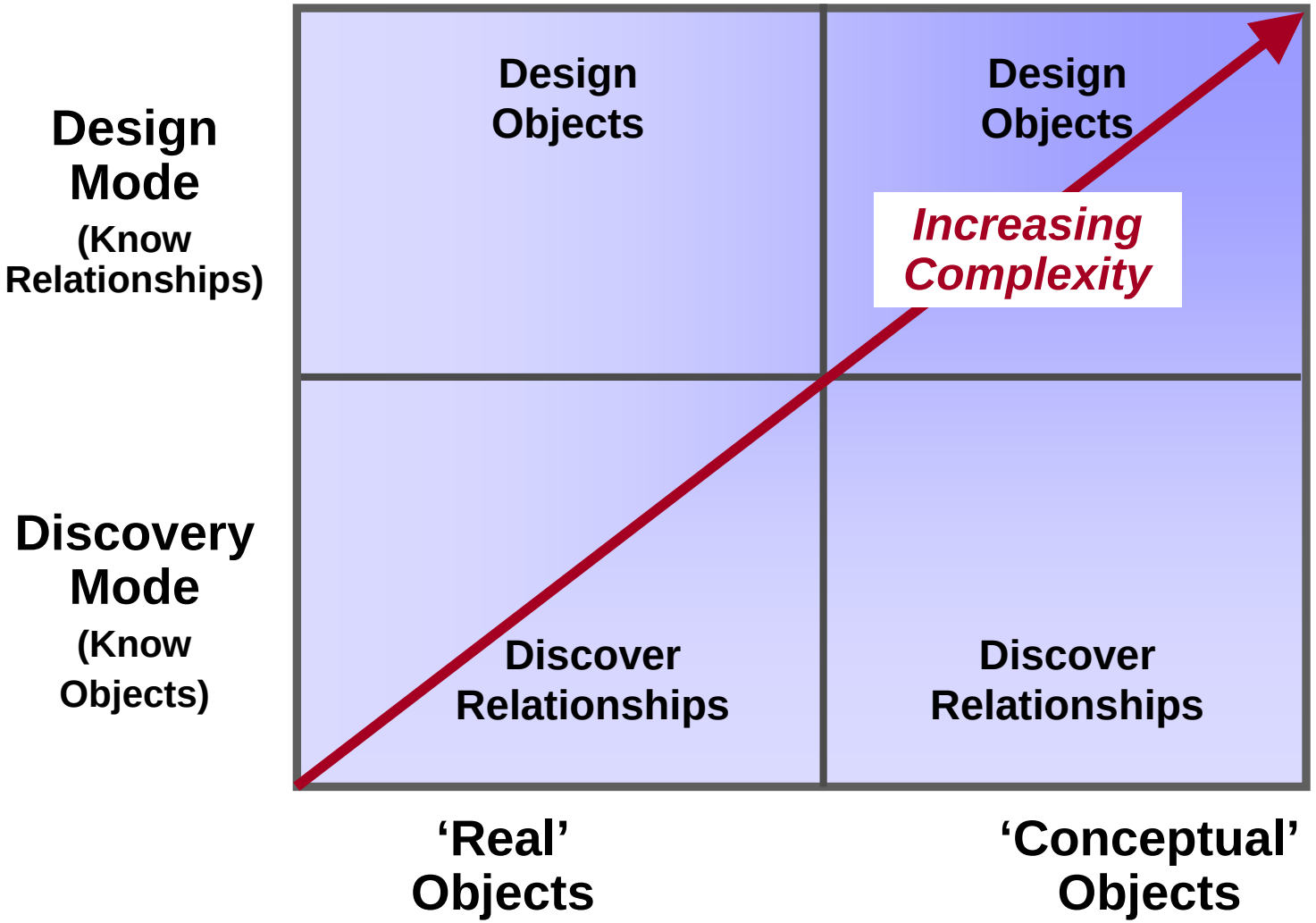
Abstraction Frames

Abstraction Stacks

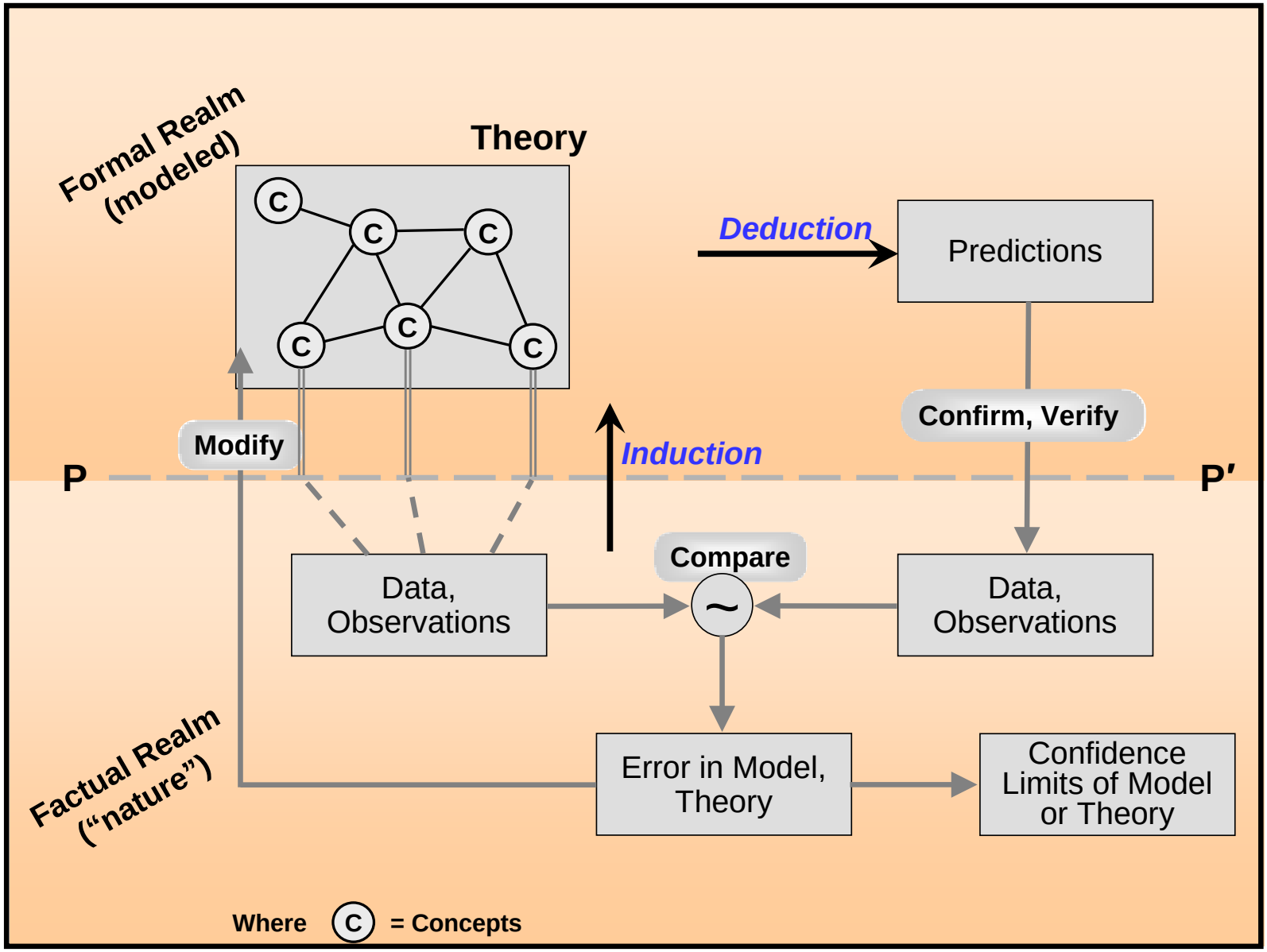
Summary

System Modes

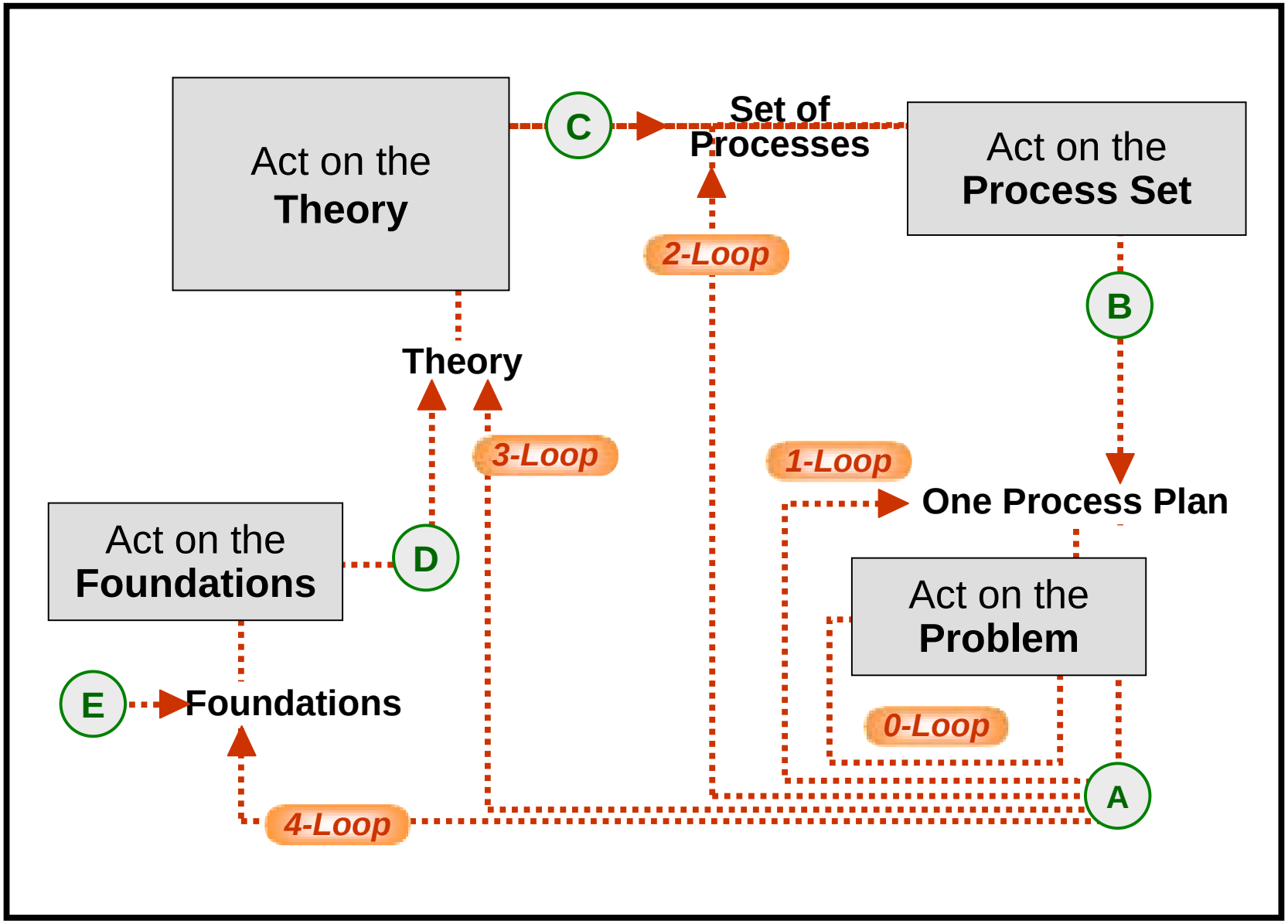
A Mapping Context for Complexity
(Does Not Address System Boundary Directly)



A.D. Hall, Cycle for Scientific Method, Model Building

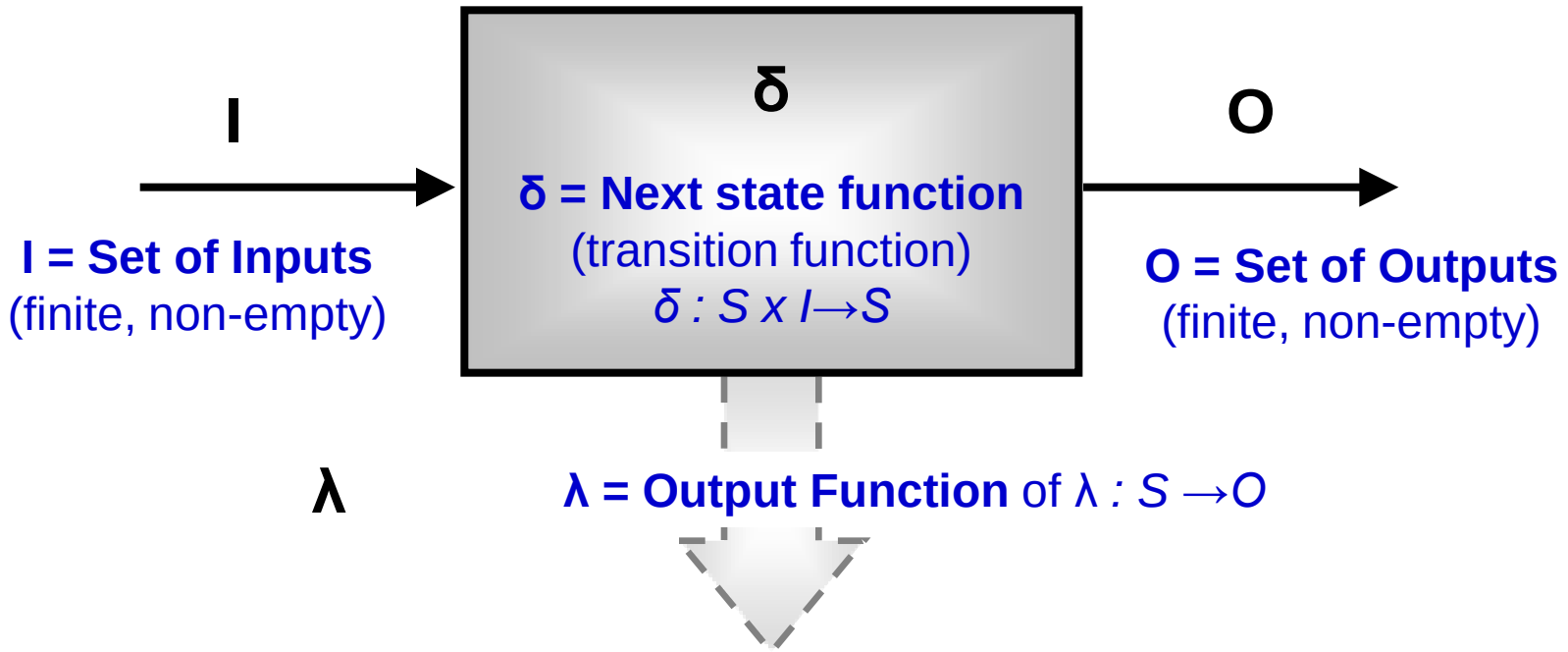


Warfield – Poly-Loop Model



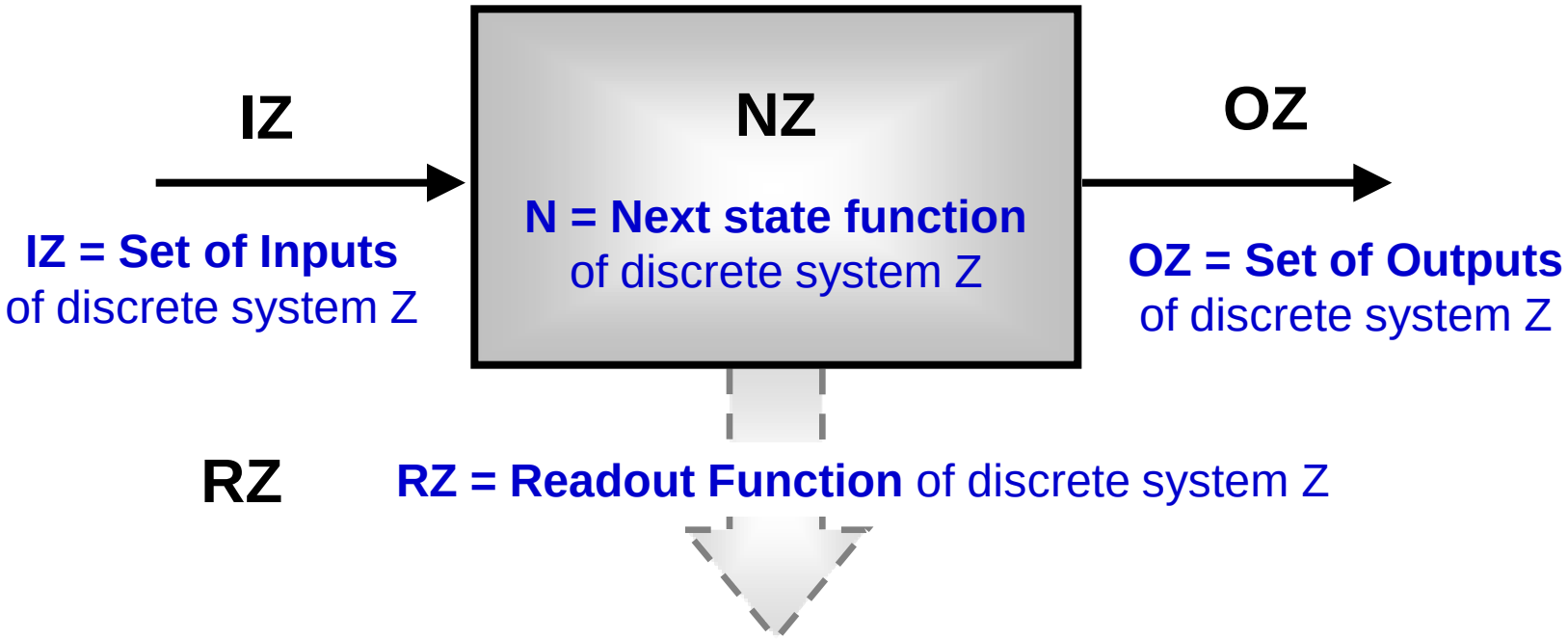
Moore Type Sequential Machine

***Moore type sequential machine quintuple*: *M* = (*S*, *I*, *O*, *δ*, *λ*)**

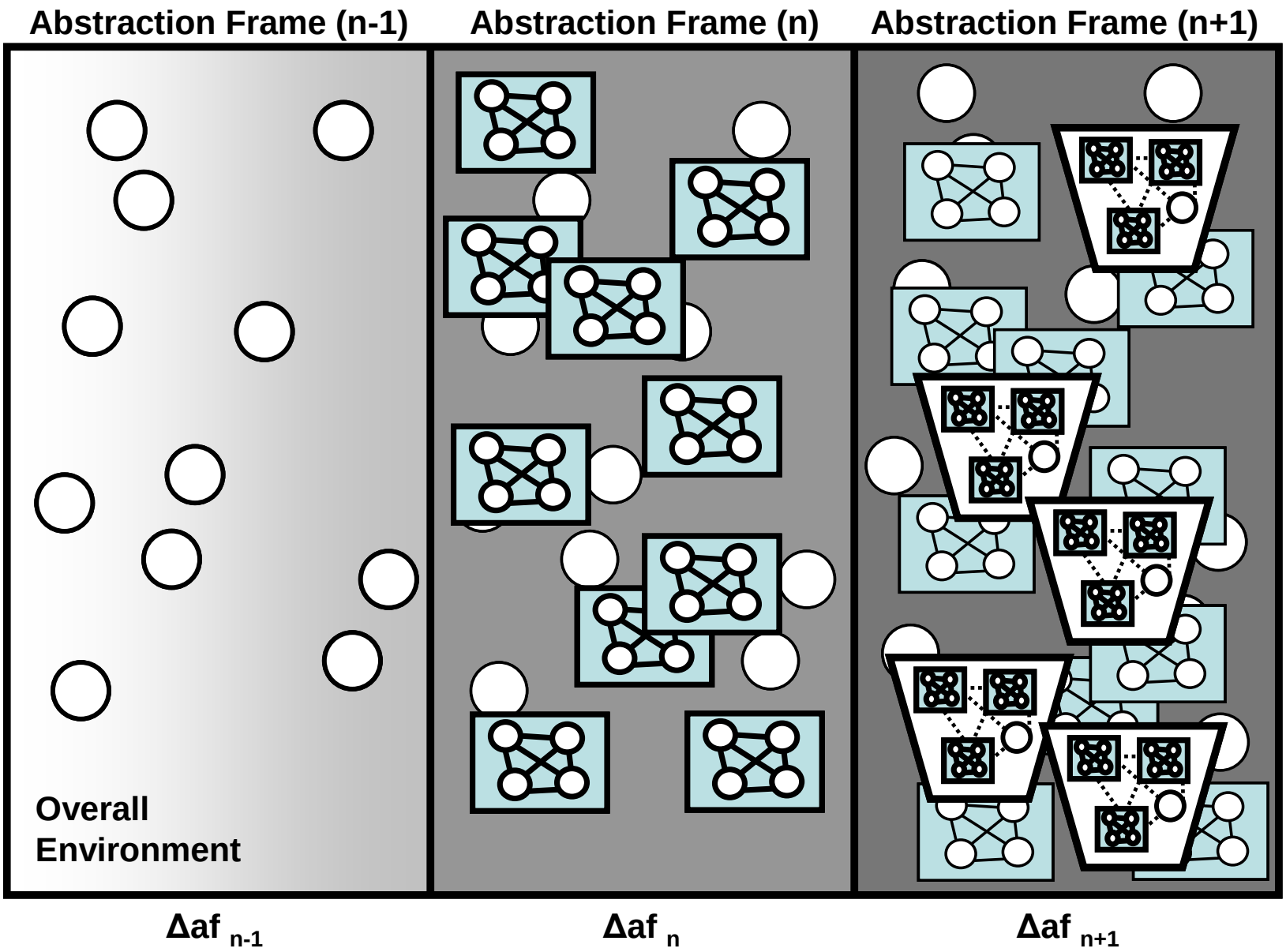


Wymore – Model-Based Systems Engineering

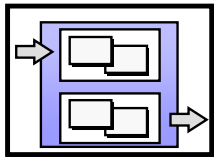
***Discrete system quintuple*: Z** = (SZ, IZ, OZ, NZ, RZ)



Abstraction Frame Sequencing

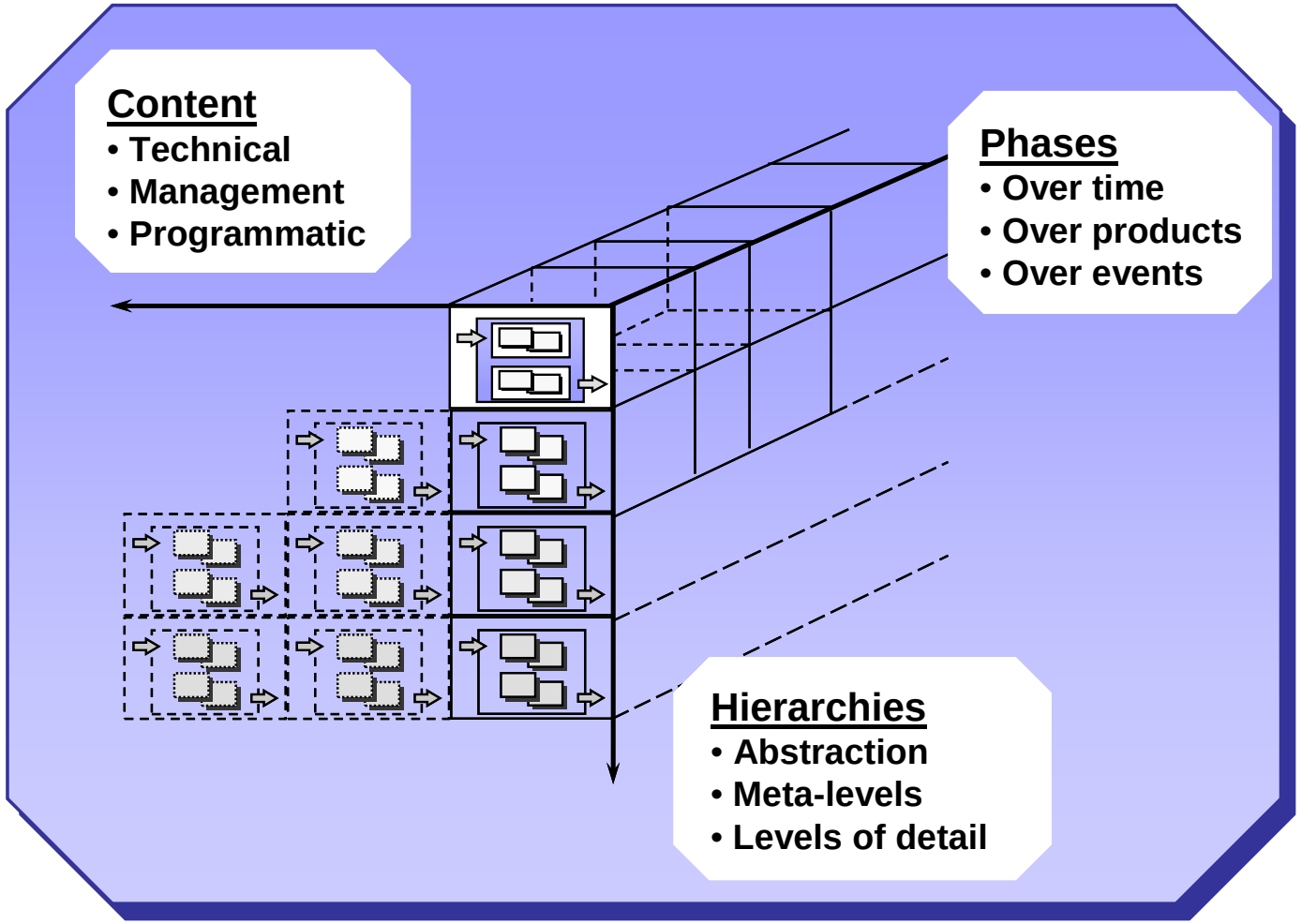


CCFRAT Approach – Phases, Hierarchies, Content



Meta Process

Applies to:



Pick One Aspect from Each Axis

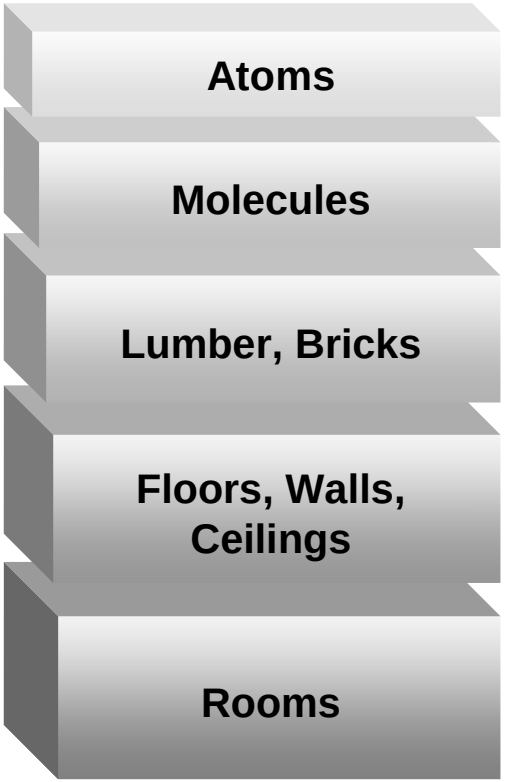
Abstraction Stacks

A House Consists of:

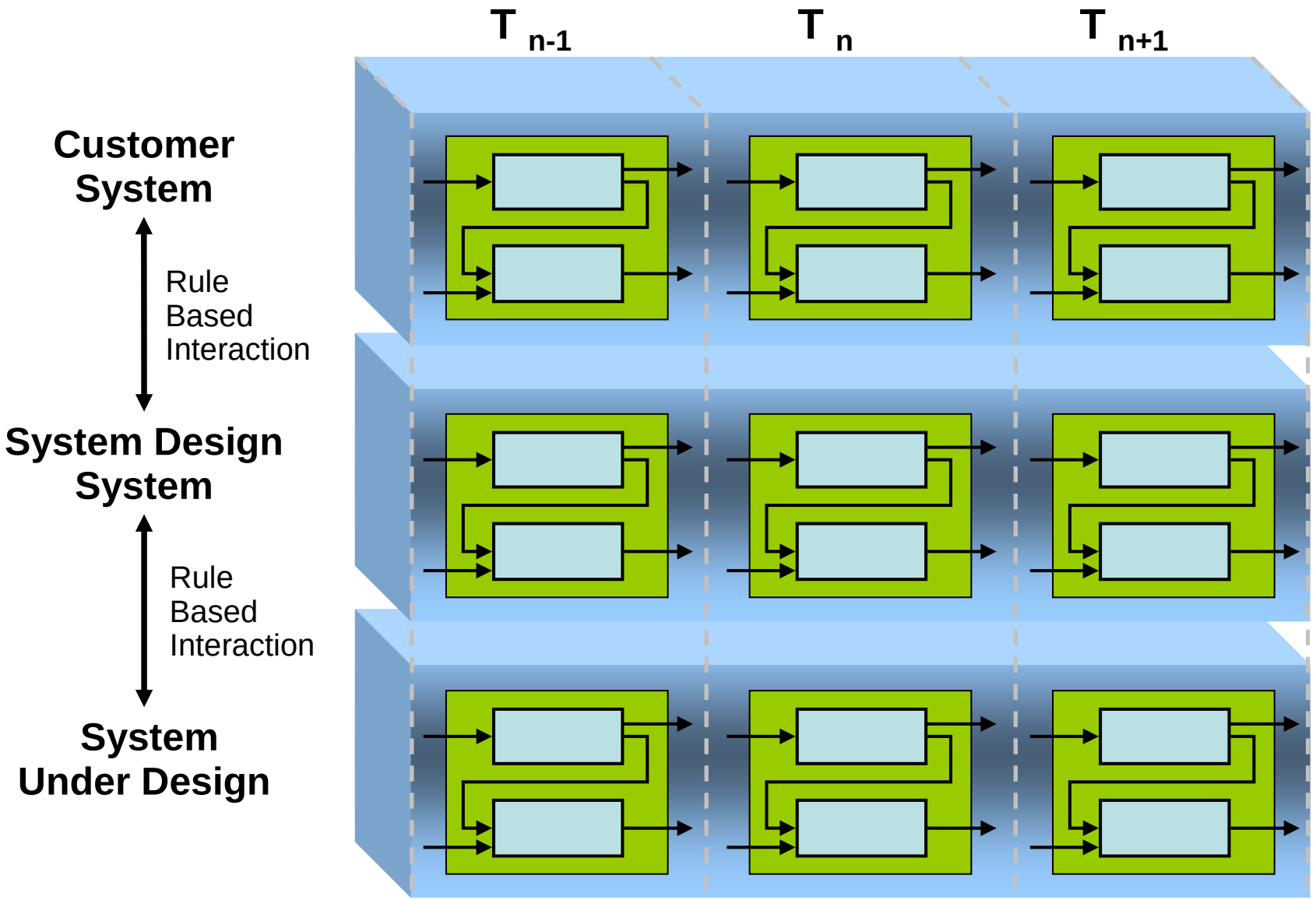
*"… house consists of several thousand pounds of carbon, some complex polymers, about 5000 bricks, two bathrooms, and 13 ceilings…"

* From Chapter 12, What do Classes Represent?, *The C++ Programming Language, 2nd Edition,* Bjarne Stroustrup, 1991.

Use Abstraction 'Stacks'



Systems Engineering Conceptual Context



Summary

Sequential machines and systems provide a **powerful conceptual pattern** for system description and design.

When **vectors/groups of systems** are used as **inputs into a "sequential system**," **each system abstraction level must be clearly defined**.

System abstraction frames and system abstraction stacks are used to help **define and control system levels**.

The combination of **meta-systems**, system abstraction **frames** and system abstraction **stacks** provide the necessary **context for** the development of an **executable systems engineering and design language**.

- **Provides context for objects and operations.**
- **Provides framework for inter-relationship mapping**

Questions