Machiavelli: New Variety Axioms to Control Highly-Complex, Coercive and Unbounded Systems

An introduction to **Variety Dynamics**

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Overview

- Introduction to Variety
- Mathematics and Variety Dynamics
- Overview of new Systems Field of Variety Dynamics
- Practical examples

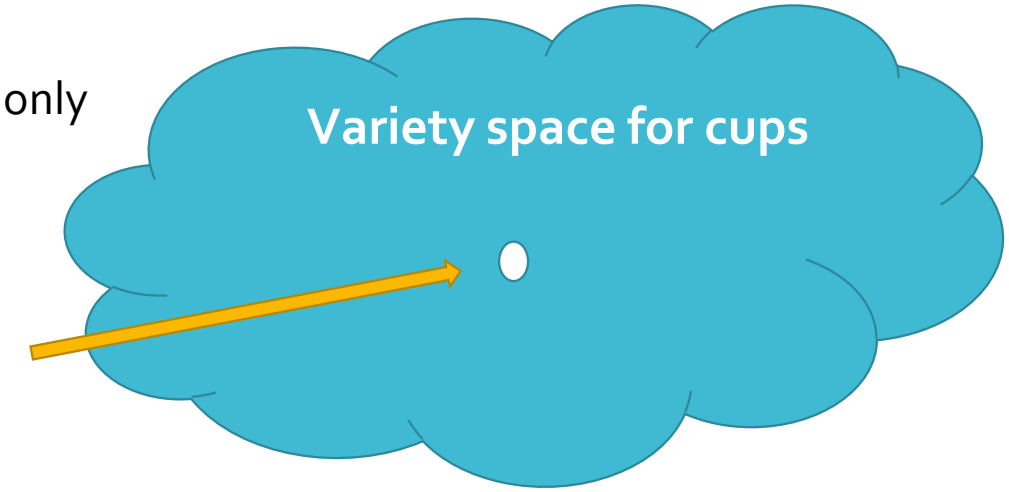
Variety

- ***Variety is the number of different possible states in a situation***

Variety in number

Variety of these cups is only In their **number**.

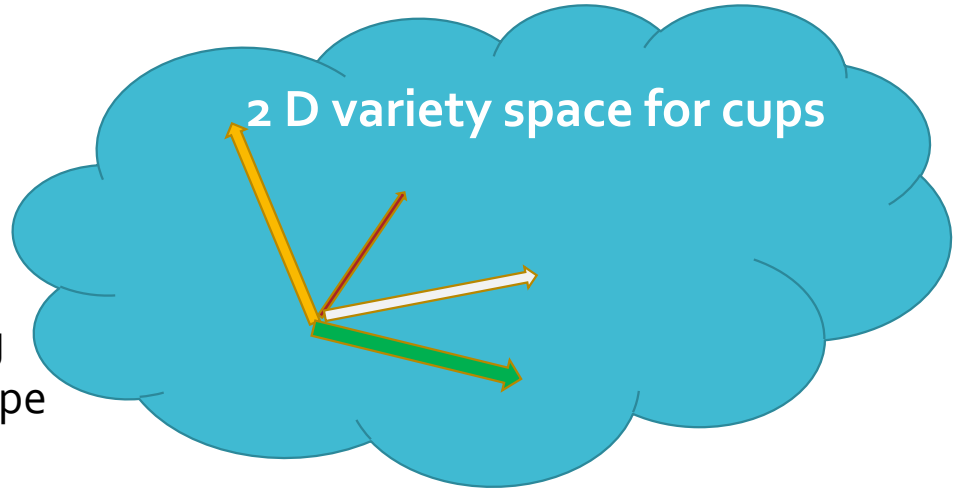
Variety is scalar and a **point vector** in the **variety space** for these cups



Variety in number and type

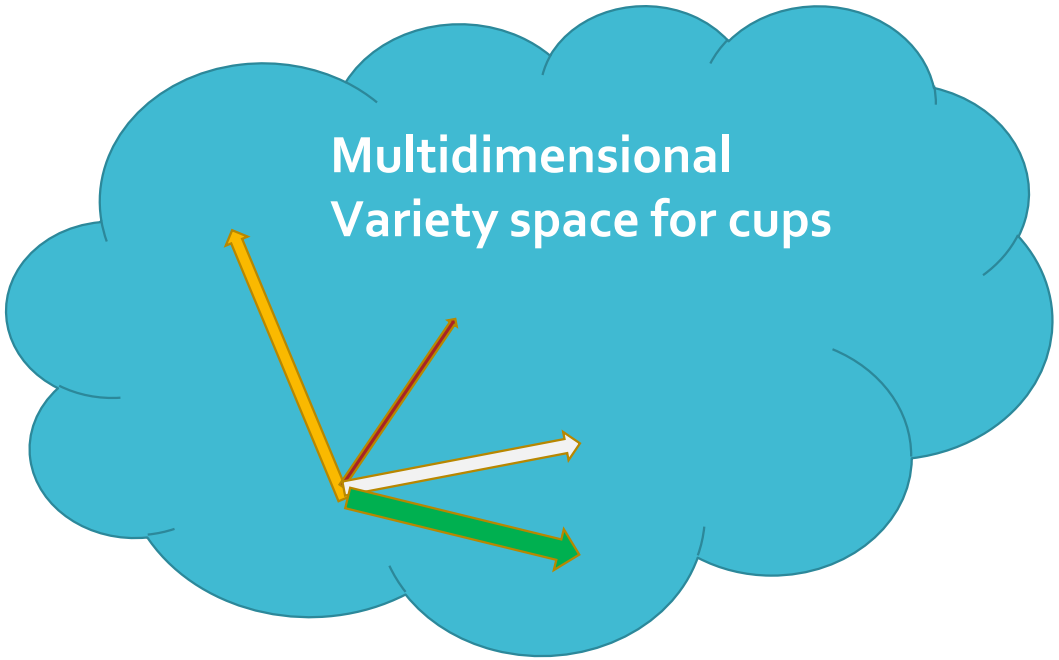
Variety of these cups is in **number** and **type**

Variety of these cups comprises multiple two dimensional; **vectors** in **variety space** indicating cup type and the number of that type

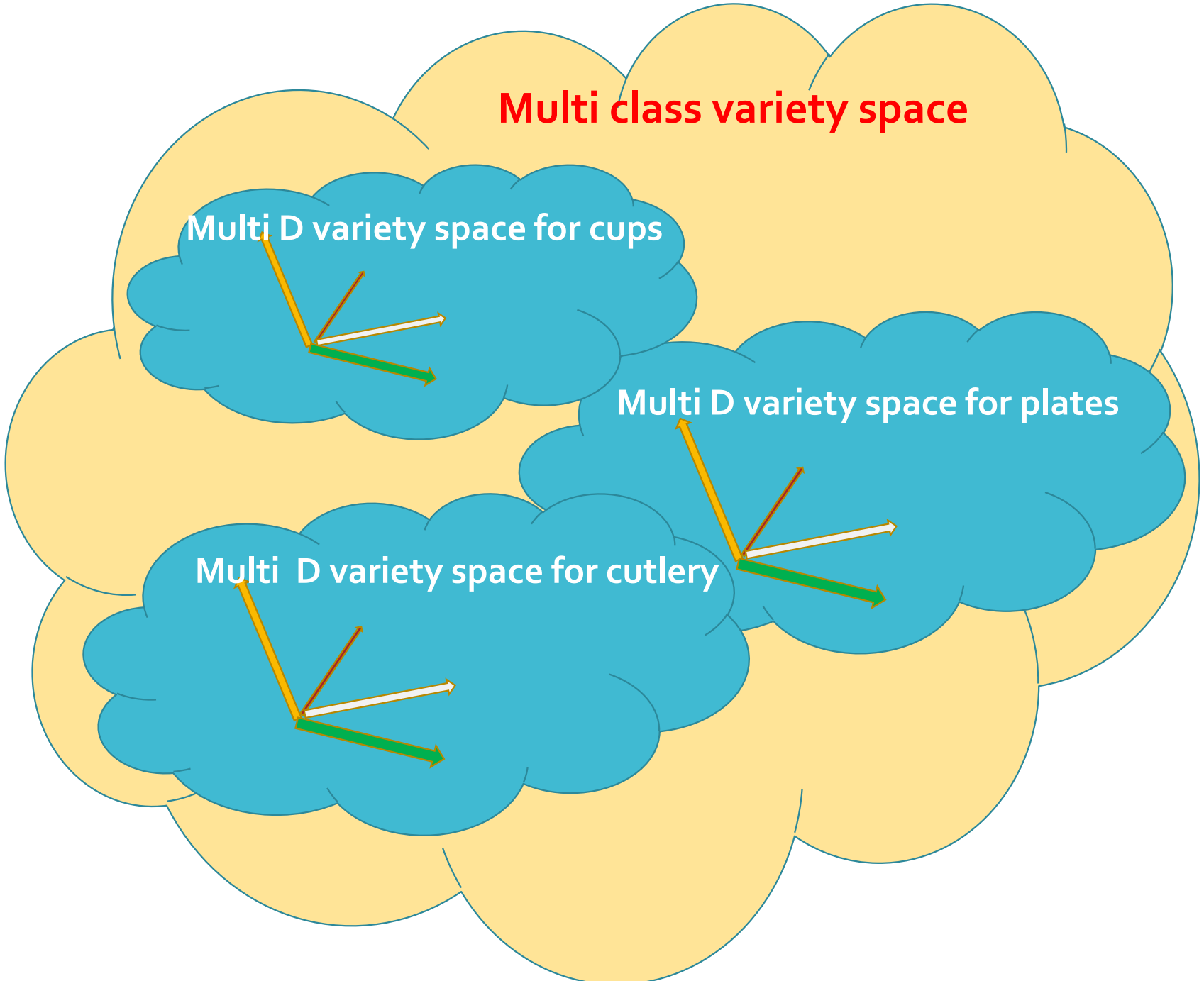


Variety of other aspects of cups

- The variety of other aspects of cups (handles, size, materials, style, coating… etc)
- can also be represented in the cup variety space
- by extending the variety space for cups into multiple dimensions



Multi-class variety spaces



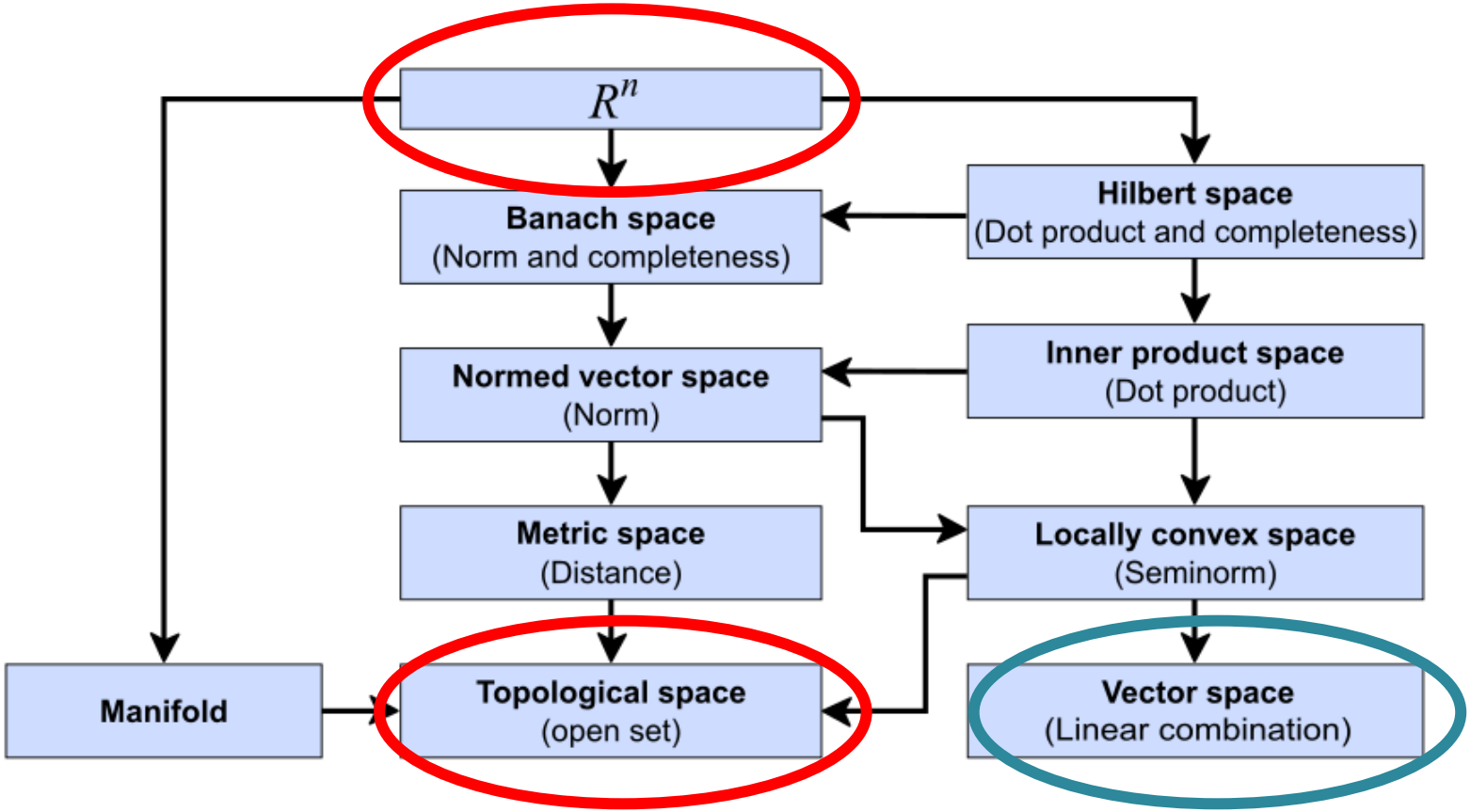
Variety space elements

- Variety spaces contain a wide range of other variety elements including:
  - Rules (e.g. plates have knife and fork, sorbet dishes have small fork and spoon, Chinese food has chopsticks, Malaysian food has no knife, Korean food has scissors)
  - Dynamics (changes with time)
  - Boundaries (functionally defined rather than fixed)
  - Relationships (including causal)
  - Projections in time and space
  - Boundary porosity functions (the way things change things across boundaries)
  - Agency abilities

Mathematics and 'spaces'

- Mathematically, a **space** consists of selected **objects** (of any sort or type) that are treated as points along with selected **relationships** between these points.
- The objects can be of many types including:
  - Characteristics
  - Functions
  - Restraints (boundaries)
  - Classification systems
  - Other spaces
- 'Spaces' can be considered as:
  - Geometric spaces (with ***m*** dimensions)
  - Algebraic spaces (of order ***m)***
  - Communication languages of order ***m***
  - Feedback loop systems of abstraction ***m+n***

Different abstractions of mathematical spaces



- Conventional **systems thinking** operates in **vector space**
- **Variety space** is at the boundaries of R^n where ***n*** is a function of the **maximum variety of any one variety sub-space** and the **variety of subspaces** themselves – or as combinations of different R^n
- **Variety space** can be envisaged as **topological space** of order ***n***.
- **Variety spaces** can also include **probability spaces**

The new Systems field of **Variety Dynamics**

- This new Systems field of Variety Dynamics focuses on:
  - The distributions, ownership, dynamics and functional relationships of **variety** in bounded and unbounded systems
  - Understanding the nature of variety spaces
  - Identifying the causal functioning between variety elements in variety spaces
  - The coercive aspects of variety spaces
  - Roles of actors/actants in variety spaces
  - Control and management of variety spaces and the related complex systems

Conceptual levels

1. Level at which things happen
2. People ordinarily plan what happens
3. People analyse how people ordinarily plan what happens
4. Basic systems models and systems thinking
5. Thinking about variety in systems and balance between control variety, system variety and environment variety
6. Thinking about distribution of control, system and environment variety across sub-systems and their conceptual representations
7. Thinking about the time and location of distributions of control, system and environment varieties
8. **Variety Dynamics:** working with the dynamic shifts in power and control that result from dynamics of change in time and location of control, system and environment **varieties**.

Axiom 1

- For complex, layered and hierarchical systems involving multiple constituencies in which the distribution of variety, variety generation and control is uneven across the system
- THEN the differing distributions of generated and controlling variety will result in structural basis for differing amounts of power and hegemonic control over the structure, evolution and distribution of benefits and costs of the system by particular constituencies/actors

Axiom 2

- *For complex, layered and hierarchical systems, the type of outcome in terms of stability depends on the relative locations of subsystems generating variety and the control subsystems able to use variety to control the system variety.*

Axiom 3

- Where differing sub-systems of control are involved in the management of a system and some sources of control are able to increase their variety to accommodate the lack of requisite variety in other control systems,
- THEN the overall distribution of control between sub-systems and constituencies will be shaped by the amount and distribution of transfer of control to the accommodating control system.

Axiom 4

- In complex systems in which multiple sources of variety generation and variety control interact
- THEN the relative effect of different forms of system variety and control variety on system behaviour and system control are dependent on their relative [Coasian] transaction costs.