Inquiry Systems:
The Philosophical Foundations of Systems Thinking

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A Brief Overview

5 Basic Types of Information/Knowledge Systems

1. Expert Consensus: Empiricism
2. Scientific Modeling: Rationalism
3. Multiple Models/Assumptions: Kant
4. Conflict: Hegel
5. Systems Thinking: Singer, Ackoff, Churchman
A Brief Overview

5 Basic Types of Information/Knowledge Systems

1. Expert Consensus  Most Common
2. Scientific Modeling  Most Common
3. Multiple Models/Assumptions  Rare
4. Conflict  Rare
5. Systems Thinking  Rarest
A Brief Overview

• A Simple Example: How to Bake the PERFECT Apple Pie
• 1. Greatest Consensus Amongst Pastry Chiefs, Ordinary Cooks, Small Town America, i.e., Who Are the “Experts”?
• 2. Chemist, #1 Ranked Pastry Chief, Biggest Celebrity Chief, i.e., the Single “Biggest Authority,” the Authority of Science, Perfect Ingredients
• 3. Multiple Authorities: by Country, Culture, Age, Towns, Contests, etc; Contrast the Assumptions
• 4. Iron Chief: Bakeoff Contest between the Two Biggest Competitors
• 5. Systemic: Bring in a Top Kitchen Designer to Factor in the Ambience of a Kitchen; i.e., “Other Variables”
The General Structure of Inquiry Systems

Valid Building Blocks/Starting Points of Knowledge

Inputs

Operator

Guarantor

Outputs

Valid Knowledge
Model 1: Expert Consensus
Coca Cola Belgium Crisis:
mid-1999, Recall of Over 30 Million Cans

1. A number of children reported that Coke tasted and smelled funny.

2. Coke scientists reported that there was nothing wrong technically with the product; therefore, Coke dismissed the claims of the children as merely “psychological,” i.e., mass hysteria.
Coca Cola Belgium Crisis:

3. However, the Belgium Health Minister took the children’s claims seriously and ordered all the cans and bottles of coke off the shelves throughout Belgium.

4. McDonald’s, a key business customer/distributor/stakeholder refused to carry Coke in its restaurants until the case was resolved.

5. From The Company’s, i.e., Coca Cola’s, standpoint, the relevant “experts” were Coke’s Quality Control scientists. They were the standard for “truth,” not the children.
The General Structure of Inquiry Systems

Valid Building Blocks/Starting Points of Knowledge

Inputs

Guarantor

Operator

Outputs

Valid Knowledge
Model 1: From Coke’s Perspective

Scientific Experts

Product Data

Quality Control Tests

Valid Knowledge

Product OK

Scientific Method

Objective Standard

Scientists ST
Model 1: From the Children’s / Media’s/ Community’s Perspective

Children As Experts

Children's Reactions

Media/ Health Minister / Children's Families / Community

Valid Knowledge

Product NOT OK

Human Feelings

Children SF / NF
Coca Cola Belgium Crisis:

Model 1 Breaks Down If There Is More Than One Set of “Experts.”
The Overall Agreement Between “Experts” Fails and Hence, the Guarantor No Longer Works, i.e., “Guarantees.”

This Is Generally True Of All Real-World, Messy Problems. Therefore, …..
The Asch Effect in Social Psychology: Which of These Two Lines Is Longer?
Person 1: Confederate

Person 2: Confederate

Person 3: Confederate

Person 4: Confederate

Person 5: Confederate

Person 6: The Naïve Subject

“The Lines Are Equal.”
Person 1: Confederate

Person 2: Confederate

Person 3: Confederate

Person 4: Confederate

Person 5: Confederate

Person 6: The Naïve Subject

“The Lines Are Equal.”

“The Lines Are Equal.”
<table>
<thead>
<tr>
<th>Person 1: Confederate</th>
<th>“The Lines Are Equal.”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person 2: Confederate</td>
<td>“The Lines Are Equal.”</td>
</tr>
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<td>Person 3: Confederate</td>
<td>“The Lines Are Equal.”</td>
</tr>
<tr>
<td>Person 4: Confederate</td>
<td>“The Lines Are Equal.”</td>
</tr>
<tr>
<td>Person 5: Confederate</td>
<td>“The Lines Are Equal.”</td>
</tr>
<tr>
<td>Person 6: The Naïve Subject</td>
<td>“The Lines Are Equal.”</td>
</tr>
</tbody>
</table>

**An Experiment in Social Conformity**
To Get Around the Asch Effect, the Delphi Method Was Invented

The Delphi Method:
A More General Example of Model 1

Polling of Isolated Experts
Each Expert Gives a Numerical Estimate, $X_i$ or Data $I$
The Numerical Estimates Are Summed and then Divided by $n$ to Produce the Average, $X_{AV}$ or $\bar{X}$
The Delphi Method: An Example of Model 1

\[ X_{AV} \] is then fed-back to the experts to see if they want to change their estimates.

The procedure is repeated for as many rounds as necessary for \( X_{AV} \) to converge.

The converged \( X_{AV} \) is then regarded as the best estimate of the truth.

Essentially, the Delphi is a special survey or polling method.
The Delphi Method: An Example of Model 1

Essentially, the Delphi Is a Special Survey Method, BUT with a Special Wrinkle.

Experts Whose Estimates Are “Too Far” from $X_{AV}$ Are Eliminated.

Thus the Delphi Method Is a Way of Forcing Agreement (Via the Operator) as Much as It Relies on Agreement as the Guarantor.
The Delphi Method

Model 1:
The Distribution of Expert Judgments Around the Mean
The Delphi Method

Model 1: Expert Judgments That Are “Too Far” From The Mean Are Excluded
Model 1: Expert Consensus

Based on the Data

Average / Operate on the Data

Tightness of the Agreement of the Data

Valid Building Blocks of Knowledge

Valid Knowledge

Conclusions Based on the Data
The Essence of Model 1

Start with:
• Data
• Observations
• Expert Judgments

“Treat” the:
• Data
• Observations
• Expert Judgments

Produce Information
The Varieties of Model 1:

- Expert Consensus
- Polls
- Consumer Panels
- Observations
- Voting
- Anything That Is Based on Aggregating Data
- Sporting Events
Model 2: Analytic Modeling
The Kidney Machine:

1. 13 year-old girl
2. 6 month old baby boy
3. 35 year-old mother of 2 children
4. 85 year-old man
5. 23 year old convicted murderer
6. 8 month old baby girl
Model 2: Develop A Single RIGHT Formula

Model 1: Get The RIGHT Data and Put It Into the RIGHT Formula
The Myers-Briggs

**ST**

- Break the Problem Down into Separate, Independent Attributes or Scales
- Determine a Single Score for Each Scale
- Combine the Scales into a Single Formula
- Measure/Weigh Each Candidate on Each Scale
- Choose the Candidate with the Highest Total Score
Model 2: Develop A Single Formula:

$$\text{ST}$$

$$\sum_{i=1}^{i=n} \left[ W_i \times S_{ji} \right] = S_j$$

- $n$ = # attributes
- $j$ = # candidates
- $W_i$ = weights

$$\text{max } S_j$$

Best Choice
Model 1: Put Data Into the Formula:

\[ ST \]

<table>
<thead>
<tr>
<th></th>
<th>13 girl</th>
<th>baby boy</th>
<th>mother</th>
<th>old man</th>
<th>murderer</th>
<th>baby girl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Expectancy</td>
<td>10</td>
<td>10</td>
<td>7</td>
<td>2</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Earning Potential</td>
<td>9</td>
<td>10</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Contribution Society</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Dependents</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

\[ \text{SCORE} = \begin{array}{cccccc}
30 & 31 & 34 & 14 & 12 & 29 \\
\end{array} \]

\[ \max S_j = 34 \]
Intuitively
Obvious Ideas
With Regard to
Attributes

Model 2

Clear Ideas ➔ Correct Mathematical Operations ➔ ONE Formula

Logic / Mathematics
The Right Data ➔ The Correct Formula ➔ Select THE Correct Person

Logic AND Data

Model 1 & 2
The Varieties of Model 2:

Fundamental Beliefs
Fundamental Assumptions
Basic Texts
Basic Authorities
Anything That Is Based on “True Beliefs”
Model 3: Multiple Models

An Integration of Models 1 & 2: A Synthesis
Executive

Formula 1
Data 1

Formula 2
Data 2

Formula 3
Data 3

Formula n
Data n

Decision Maker's Formula

Decision Maker's Data
More Generally

Executive

Assumptions 1 → Data 1
Assumptions 2 → Data 2
Assumptions 3 → Data 3
Assumptions n → Data n

Decision Maker’s Assumptions

Decision Maker’s Data
Executive / Decision Maker

- **CEO**
  - **CEO Data**

- **CFO**
  - **CFO Data**

- **Legal**
  - **Legal Data**

- **Security**
  - **Security Data**

**Decision Maker’s Crisis Strategy**

**Crisis Action Plan**
Model 4: Conflict
Coca Cola Belgium Crisis

1. The Children Are Experts
2.
3.
4.

1. Only Scientists Are Experts
2.
3.
4.
<table>
<thead>
<tr>
<th></th>
<th>RMK Abrasives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>All Abrasives Problems Are the Same</td>
</tr>
<tr>
<td>2.</td>
<td>Management Problems Are the Same</td>
</tr>
<tr>
<td>3.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>All Abrasives Problems Are Unique</td>
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<tr>
<td>3.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
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</table>
The Fundamental Purpose of Model 4 Is to Expose/Raise Critical Background Assumptions to the Surface Where They Can Be Examined and Debated
Model 4: The Distribution of Expert Judgments Around the Mean
Model 4: Only Those Expert Judgments “Far From” the Mean Are Kept

POLICY DELPHI
Model 5: Systems Thinking
Positivism

Antisystems Thinking

RIGOROUS

Branches of Knowledge

Logic

Math

Physics

Chemistry

Biology

Psychology

Sociology

History

Philosophy

Theology

VAGUE

Branches of Knowledge
NO FIELD OF KNOWLEDGE IS MORE FUNDAMENTAL THAN ANY OTHER

ALL FIELDS PRESUPPOSE EACH OTHER
All Crises Are Linked Together
Every Crisis Is Part of Every Other Crisis
Crisis

Mess_1

P1

P2

P3

CM Framework
Proactive Culture

Systems Thinking X MB

Mess_2
Chain
DC
Crisis Action Plan

Model 5
Example: SARS

The Systemic Nature of Crises
Dynamics of SARS Crisis

16 Nov 02: First cases of “Atypical Pneumonia” are reported in Guangdong, China.

23 Feb: Doctor travels to Hong Kong infects 12.

12 Feb: TXT Message to 17 million.

WHO Struggles to assess the scope of outbreak in light of Chinese Government resistance.

Chinese Public sees illness and recognizes government control, seeks informal networks: rumor, txt, email.

Media reports illness, China Gov cracks down, international media fueled by rumors, panic spreads.

Doctors frustrated by government control, fuel informal network.

Numbers of SARS patients explodes exponentially.

Public loses confidence in Chinese government and others to control spread.

Informal networks fuel panic, media reports rumors.

Chinese government loses credibility, Canadian government struggles to contain SARS.

WHO institutes travel restrictions, Airlines affected.

WHO institutes travel restrictions, Airlines affected.

Global crisis erupts.

Mar 03: Global crisis erupts.

Markets respond, Airlines lose customers, unemployment surges, clinics thrive, hospitals suffer.

Trigger Event / Dynamic

16 Nov 02

23 Feb 03

Trigger Box

Mar 03

Global crisis erupts
Objectivity

1. Based on Hard Facts
2. Firm Deductions from Rigorous Theories
3. Product of Multiple Perspectives
4. Product of the Most Intense Debate
5. Product of the Most Diverse Inquiry: Epistemology, Ethics, Aesthetics
Model 5 Is A Theory About ALL The Models

It Is About The Management of Inquiry
## Systemic Pragmatic Inquiry

### The Management of Inquiry

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Consensual</th>
<th>Analytic</th>
<th>Multiple</th>
<th>Dialectical</th>
<th>Systemic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Consensual</td>
<td>Order/Structure</td>
<td>Model Expansion</td>
<td>Conflict Generation</td>
<td>Systems Expansion</td>
<td></td>
</tr>
<tr>
<td>2. Analytic</td>
<td>Enhancing/Preserving</td>
<td>Model Expansion</td>
<td>Conflict Generation</td>
<td>Systems Expansion</td>
<td></td>
</tr>
<tr>
<td>3. Multiple</td>
<td>Variety Reduction</td>
<td>Model Reduction</td>
<td>Variety Perpetuation</td>
<td>Conflict Generation</td>
<td>Systems Expansion</td>
</tr>
<tr>
<td>4. Dialectical</td>
<td>Conflict Reduction</td>
<td>Conflict Suppression</td>
<td>Conflict Reduction</td>
<td>Conflict Perpetuation</td>
<td>Systems Expansion</td>
</tr>
<tr>
<td>5. Systemic</td>
<td>Systems Reduction</td>
<td>Systems Reduction</td>
<td>Systems Reduction</td>
<td>Systems Reduction</td>
<td>Systems Enhancing</td>
</tr>
</tbody>
</table>
Broader Set of Inquiry Systems
Comparative Inquiry

1. Expert Consensus Empiricism
   - Inputs: Observations
   - Operators: Mean/Mode
   - Guarantors: Tightness of Agreement, StanDev
   - Outputs: Factually Based Claims
2. Analytic Modeling Rationalism
   - Inputs: Expert Judgments, Intuitively Clear Indubitable Ideas
   - Operators: Valid Rules of Logic
   - Guarantors: Law of Contradiction
   - Outputs: Theorems Logical Claims
3. Multiple Models
   - Inputs: Mess
   - Operators: Judgment of Decision Maker(s)
   - Guarantors: Broad Perspectives
   - Outputs: Multidisciplinary Based Decision
4. Dialectic Modeling
   - Inputs: Messy Conflict
   - Operators: Dialectic Process
   - Guarantors: Intense Conflict
   - Outputs: Syntheses
5. Existential Inquiry
   - Inputs: Crises Despair
   - Operators: Working Through Crises
   - Guarantors: Strength of Human Spirit
   - Outputs: Renewed Hope vs. Greater Despair
6. Feminist Inquiry
   - Inputs: Problematic Relationships
   - Operators: Empathetic Understanding
   - Guarantors: Human Presence Comfort
   - Outputs: Deeper Sustained Relationships
7. Post Modern
   - Inputs: Collapse of Modernism
   - Operators: Textual Analyses
   - Guarantors: No Truth/All Equal
   - Outputs: Problematic Anti-Knowledge
8. SYSTEMS THINKING
   - Inputs: Moods of Previous Inquiry Systems/Mess
   - Operators: Management of Inquiry
   - Guarantors: Interdisciplinary Inquiry Systems Thinking
   - Outputs: Better Methods of Coping with Messy Inquiry
A Deeper Look
1. Expert Consensus Inquiry Systems

Simple Inputs: Factual Questions; Questions to Which the "Answers" Can Be Expressed in Numbers

Operator: Consensus among Experts/Observation/Aggregation Mechanisms / Central Tendency

Guarantor: "Tightness" of AGREEMENT The Expert Community Itself

Outputs: "Facts" / SINGLE ANSWERS, #s "Best SINGLE POINT Estimates"

Appropriate for Well-Structured, Bounded Problems
2. Formal (Analytic) Model Inquiry Systems

**Simple Inputs**: "Self-Evident 'Truths'", Axioms, Postulates

**Operator**: Formal Modeling Procedures

**Guarantor**: Formal Logic: The "LAW" of the Excluded Middle, ie, \( \neg(p \& \neg p) \)

**Outputs**: Theorems, SINGLE MODELS

Appropriate for Well-Structured, Bounded Problems

Complex Inputs: Multiple Models; Data Are a STRONG FUNCTION of Models, Theories, Values, PRESCRIPTIONS; Ever Since KANT, Description Vs. Prescription Is Philosophically Naive: The Wine Glass Metaphor of Knowledge!

Operator: "The Executive"; The "Choice / Range" of Models to Present to a Decision-Maker & the "Process" by Which They Are Presented

Guarantor: Multiple FORMULATIONS of "Complex Problems"; DECISION-MAKER(S) PARTICIPATION in the Modeling of "Their" Problems

Outputs: Awareness of Model Assumptions; "Tuned" Model; Model Implementation? Extreme Frustration; Hopelessness

Appropriate for Complex, Semi-Structured, Semi-Bounded "Problems" for Which Multiple Views of the Problem Are Essential EVEN IF THEY LEAD TO CONFUSION OR STALEMATE, eg, The Cuban Missile Crisis / IRAQ
4. Dialectical Inquiry Systems -- Interpretative Inquiry

Complex Inputs: The "Two" Most Strongly Opposing Models of ANY SITUATION;
Data Are a STRONG FUNCTION of Opposing World-Views; Data Have NO MEANING Until They Are Coupled to a World-View or an INTERPRETATION of the World

Operator: A Dialectical Debate

Guarantor: CONSTRUCTIVE CONFLICT; One Is Not Informed Unless A Decision Is the Product of the Most Intense Debate;

\[( P \& \sim P )------> P'\]

Outputs: Awareness of Model Assumptions; Contingent Actions?

Extreme Confusion & Frustration

Appropriate for Complex, Highly Ill-Structured, Un-Bounded "Problems" for Which Dialectical Views of a Problem Are Essential EVEN IF THEY LEAD TO CONFUSION OR STALEMATE, eg, The Cuban Missile Crisis / IRAQ
5. Systemic / Pragmatic Inquiry Systems -- **Appreciative Inquiry**

Complex Inputs: Epistemic, Ethical, Aesthetic, & Spiritual Views of Complex Messes

Operator: **Un-Bounded Modeling; MESS MANAGEMENT**

Guarantor: **Systemic Thinking; Theory of Knowledge; Ethical Management**  
**Applied Philosophy: Philosophy As Inquiry**  
**Management of ISs**  
Problems Are the PRODUCT of Their INTERACTIONS & Not the Sum of Their Parts

Outputs: Broadest Possible Views of Complex Problems & Their Interactions  
**Extreme Frustration**

Appropriate for Complex, Highly Ill-Structured, Un-Bounded "Problems" for Which SYSTEMIC Views of a Problem Are Essential **EVEN IF THEY LEAD TO CONFUSION OR STALEMATE**, eg, World Starvation
6. Existential Inquiry Systems

Complex Inputs: Prolonged Series of Crises; Loss of Meaning; Spiritual Emptiness

Operator: Existential Therapy; Spiritual Development

Guarantor: Spiritual Growth; Radical Change of Meaning; Growth Can No Longer Be Achieved With Old Dysfunctional Systems

Outputs: New Sense of Purpose & Meaning; Extreme Frustration; Hopelessness

Appropriate for Radical Individual & Organizational Growth, Transformation