Typologies and Tradeoffs
A Standardized Approach to Creating Participatory Fuzzy Cognitive Maps

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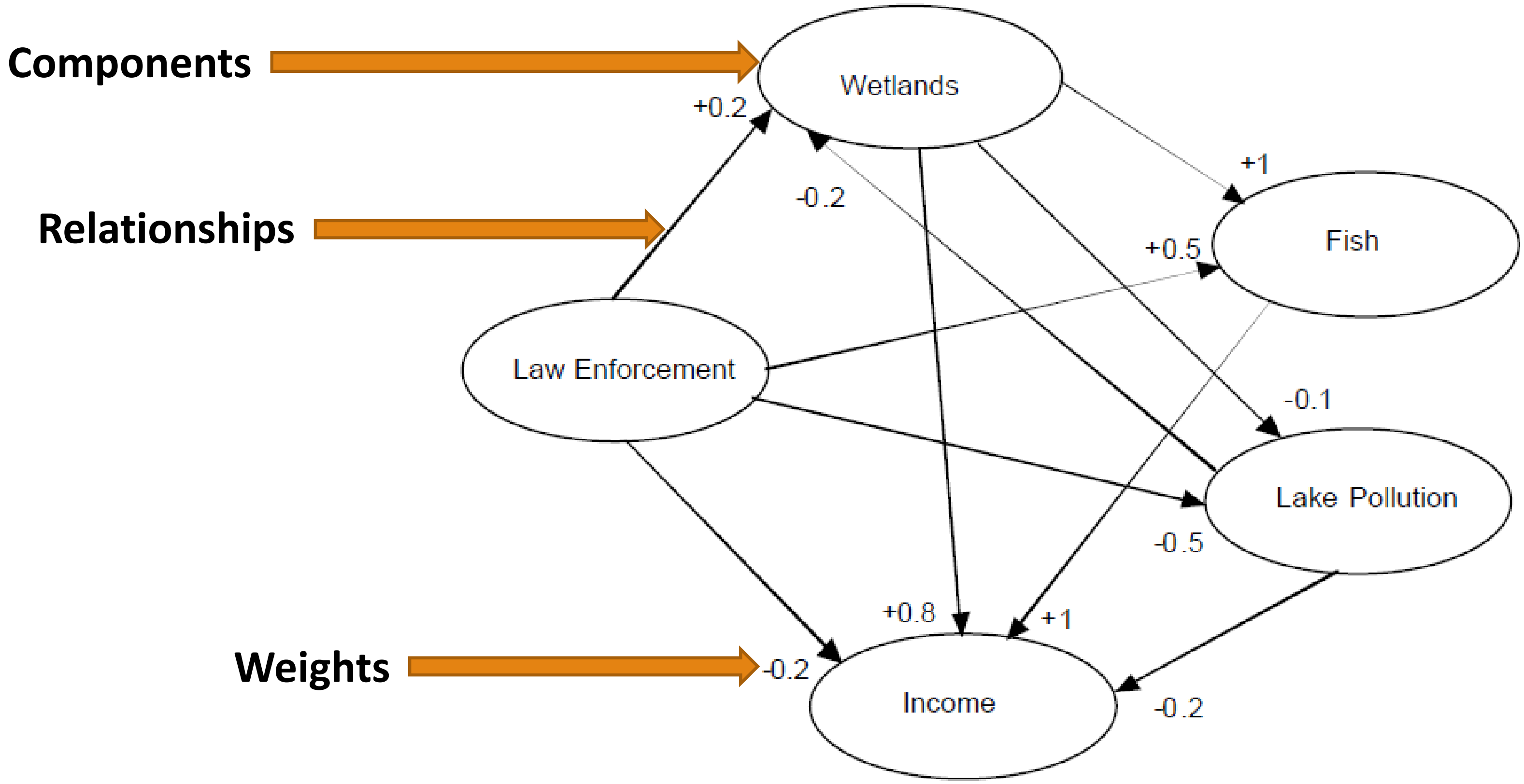
Fuzzy Cognitive Maps

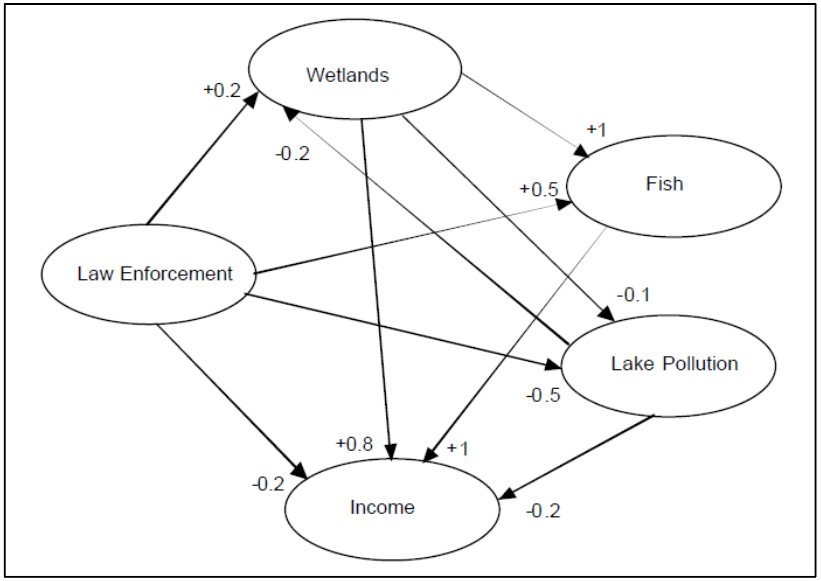


Example from Özesmi and Özesmi (2004)

Map to Matrix

Cognitive maps can also be represented as an adjacency matrix.

Calculations using matrix algebra



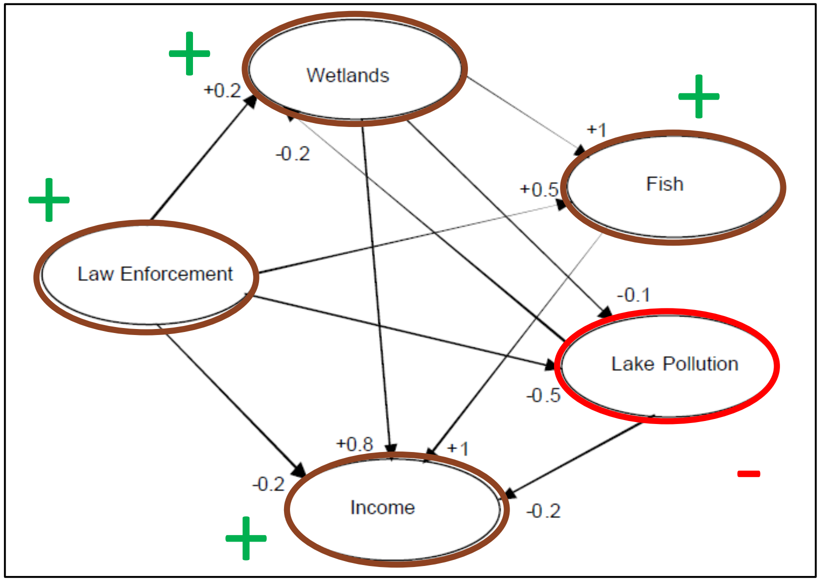
	1.Amount of wetland	2. Fish Population	3. Pollution	4. Livelihood	5. Laws
1. Amount of wetland	0	1	-0.1	0.8	0
2. Fish Population	0	0	0	1	0
3. Pollution	-0.2	-1	0	-0.2	0
4. Livelihood	0	0	0	0	0
5. Laws	0.2	0.5	-0.5	-0.2	0

Example from Özesmi and Özesmi (2004)

Scenario Analysis

Scenario: Law Enforcement increases

Great tool for observing system behavior



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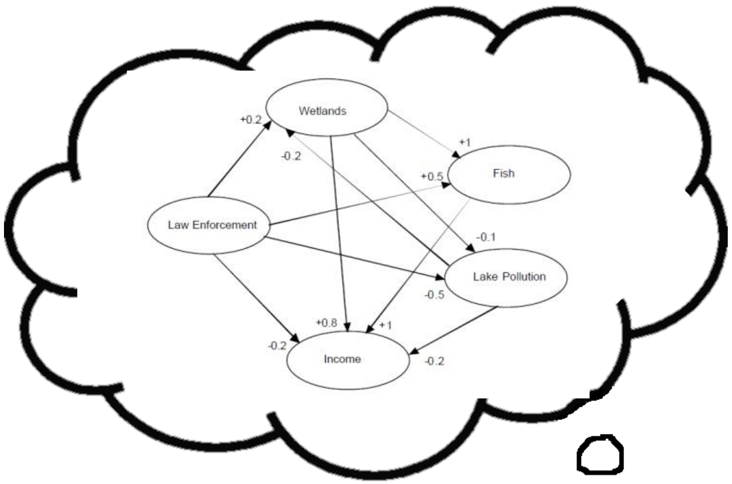
Example from Özesmi and Özesmi (2004)

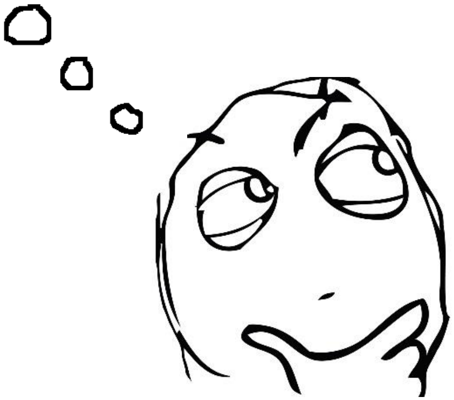
Participatory FCM's

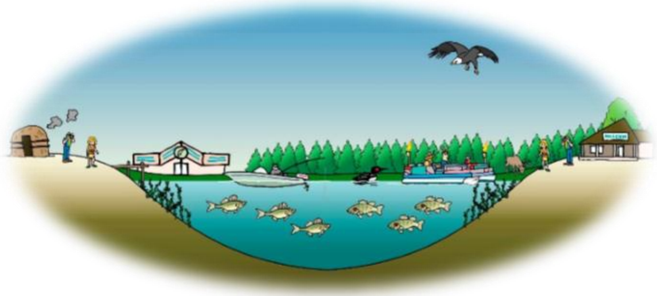
FCM's used to represent Mental Models of Stakeholders and

Non-Traditional Experts



Internal representation





External reality

The Modeling Wild West

Participatory FCM's are uncharted territory!

What are the benefits?

Who should be involved?

What methods should be used?

What outcomes can be expected?

What are the limitations?

Participatory FCM Typology

4-P's approach to participatory modeling:

Purpose – what were the goals/objectives?

Partnerships – who was involved and how?

Process – what methods were used?

Products – what were the outcomes?

The Dataset

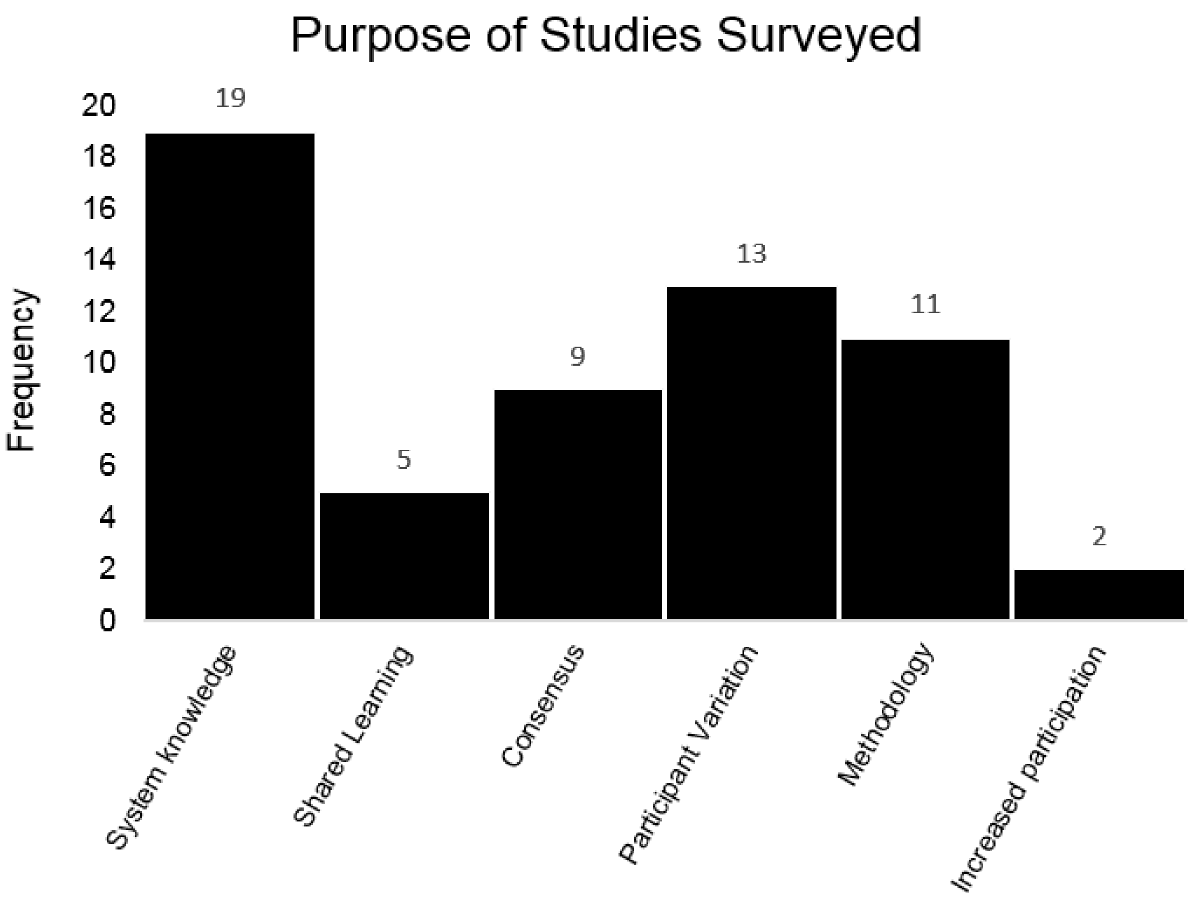
32 Studies within 30 publications

Variety of contexts, participants, and objectives, and methods.

Journals:

Modeling, Environment, Ecology, Policy and Economics, Management, Interdisciplinary

Purpose - Objectives



Most common:

Increasing knowledge about a complex system (59%)
&
Understanding stakeholder variation (41%)

Lacking:

Shared learning
Increased participation

Need for more applied outcomes.

Partnership – Participant Classification

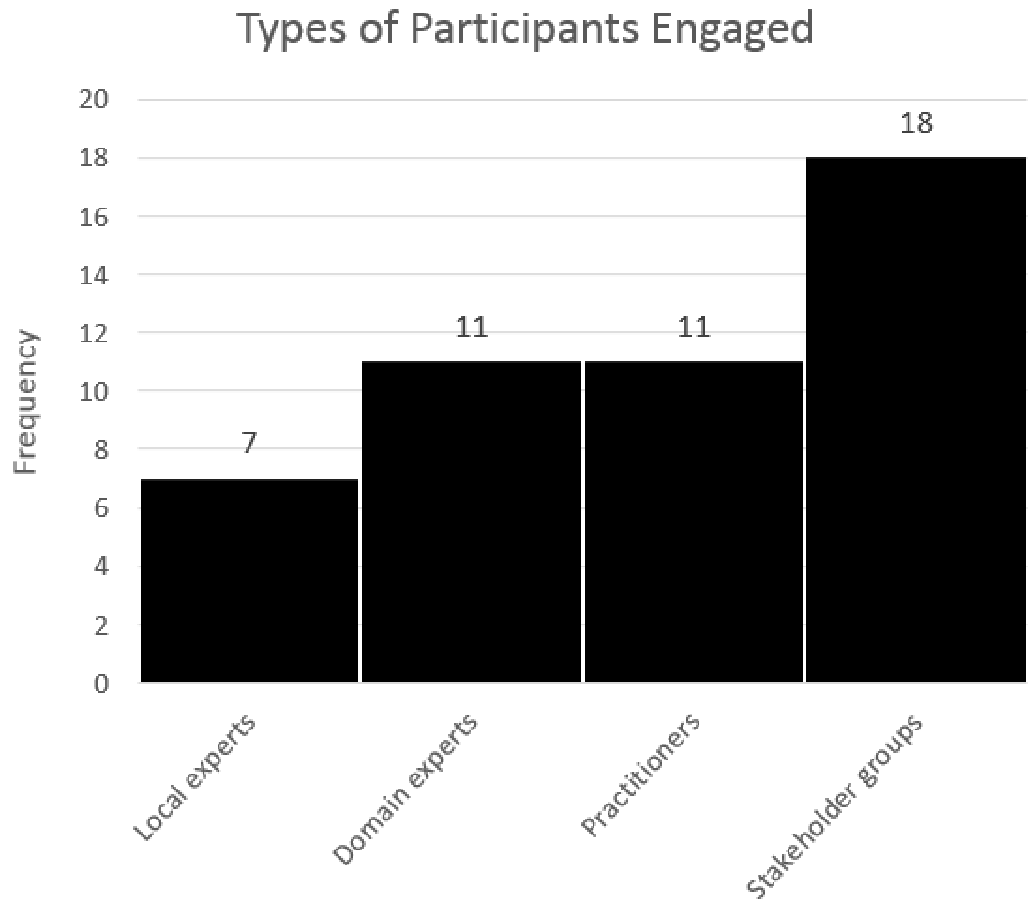
Most common:

Diverse sets of **stakeholder groups** (56%)

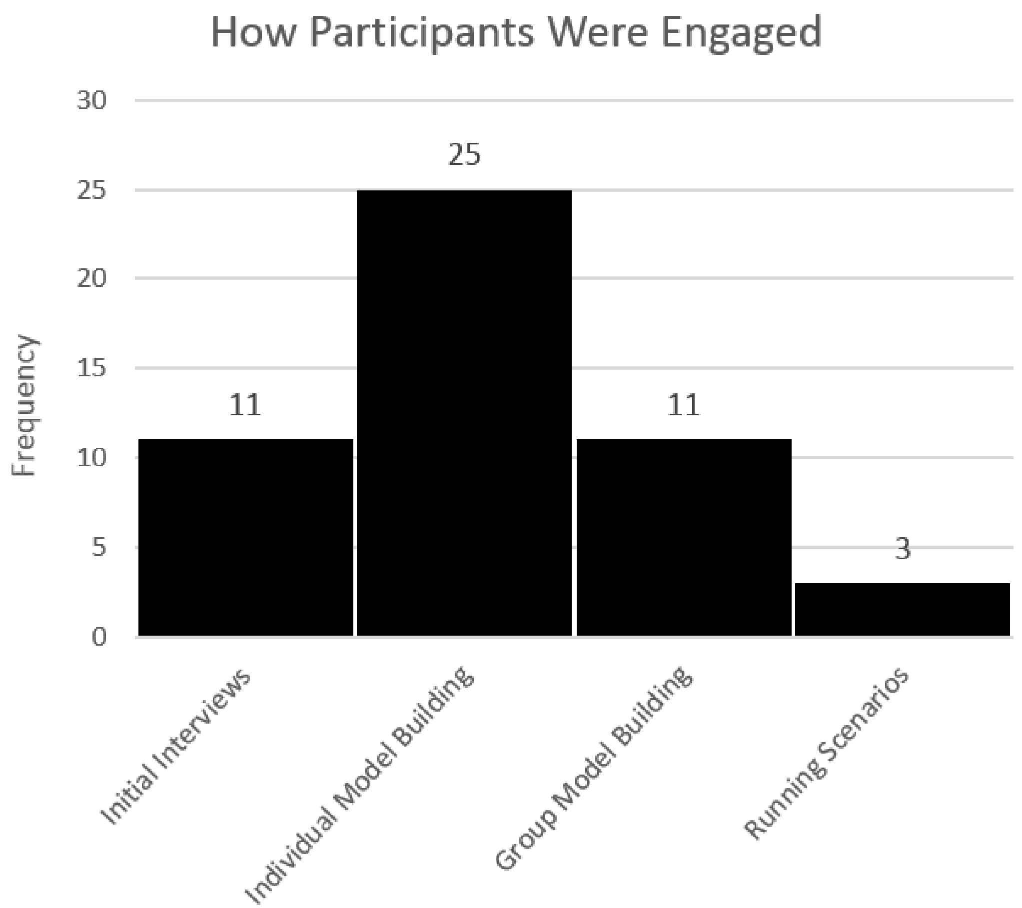
These studies often included members of the other categories as a stakeholder type

Least common:

Studies specifically focusing on **Local experts** (22%)



Partnership – Participant Roles



Most common:

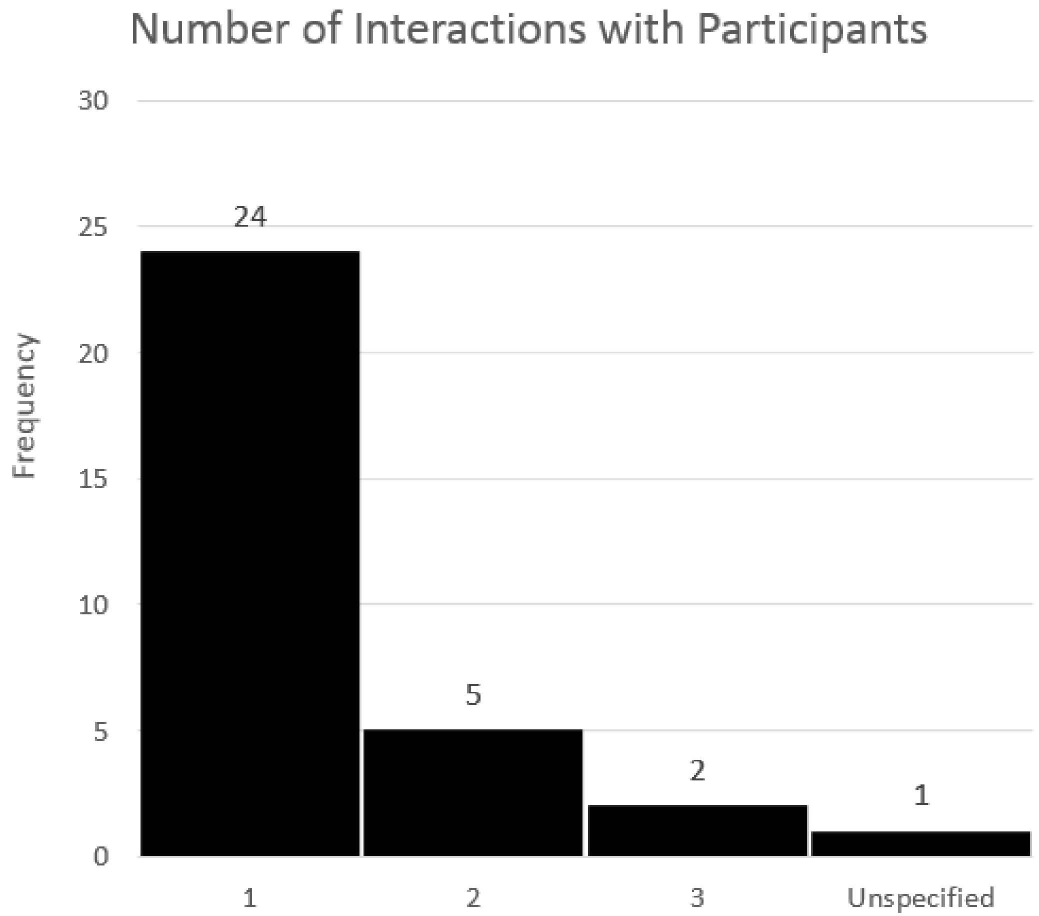
Individual Model Building
(78%)

Least common:

Involvement in running scenarios
(9%)

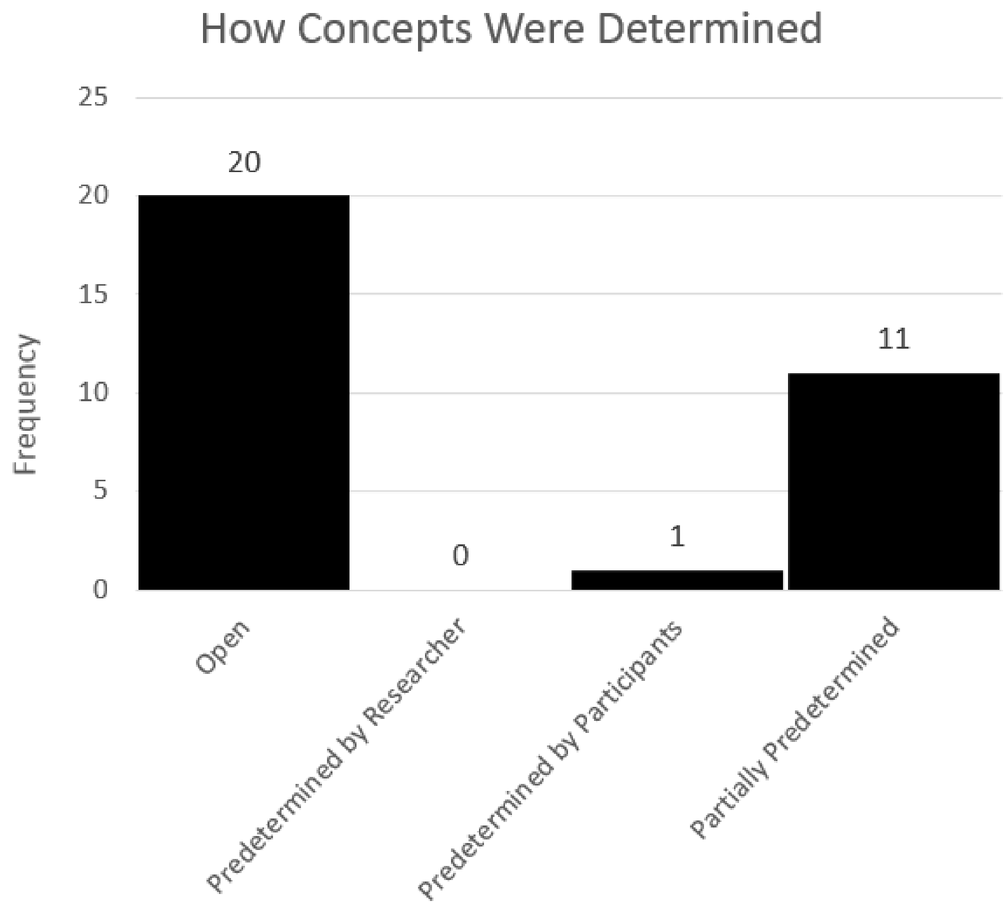
Partnership - Interactions

Most studies involved participants in only **one interaction** (75%)

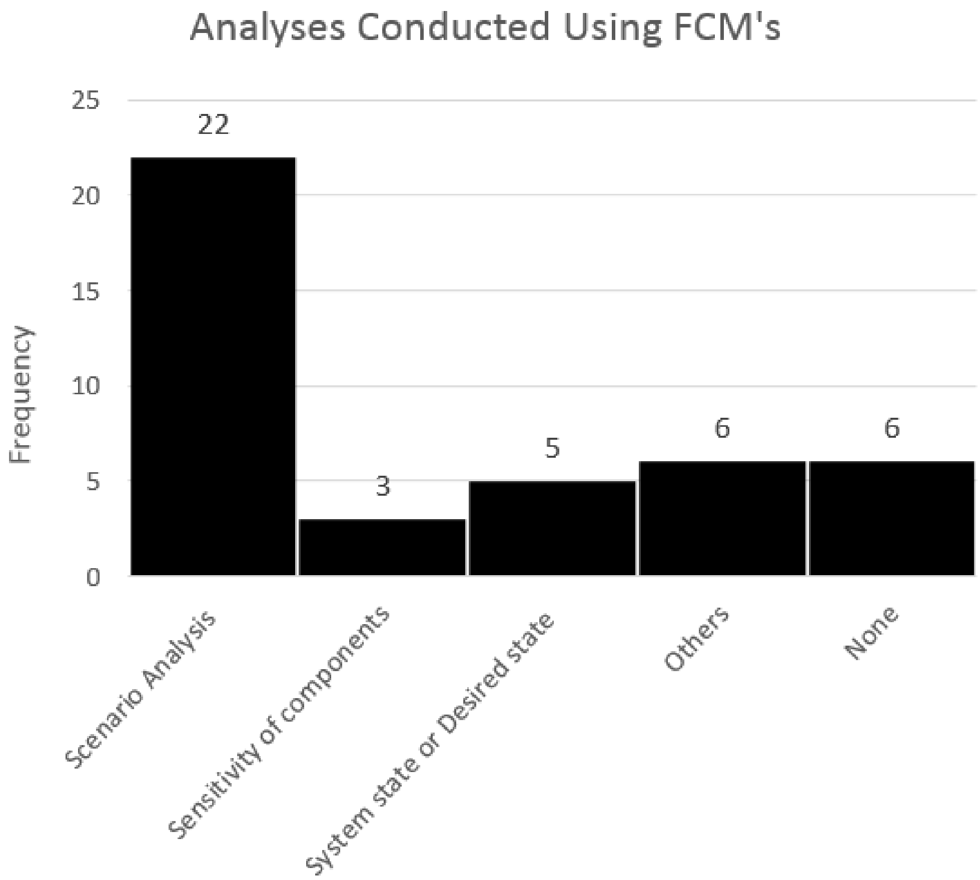


Process – Concept Determination

Concepts determination was largely **open** (63%) entirely to the respondent, with some **predefining of concepts** (34%)



Process – Comparative Analysis



Most studies used **Scenario Analysis** of some sort (69%)

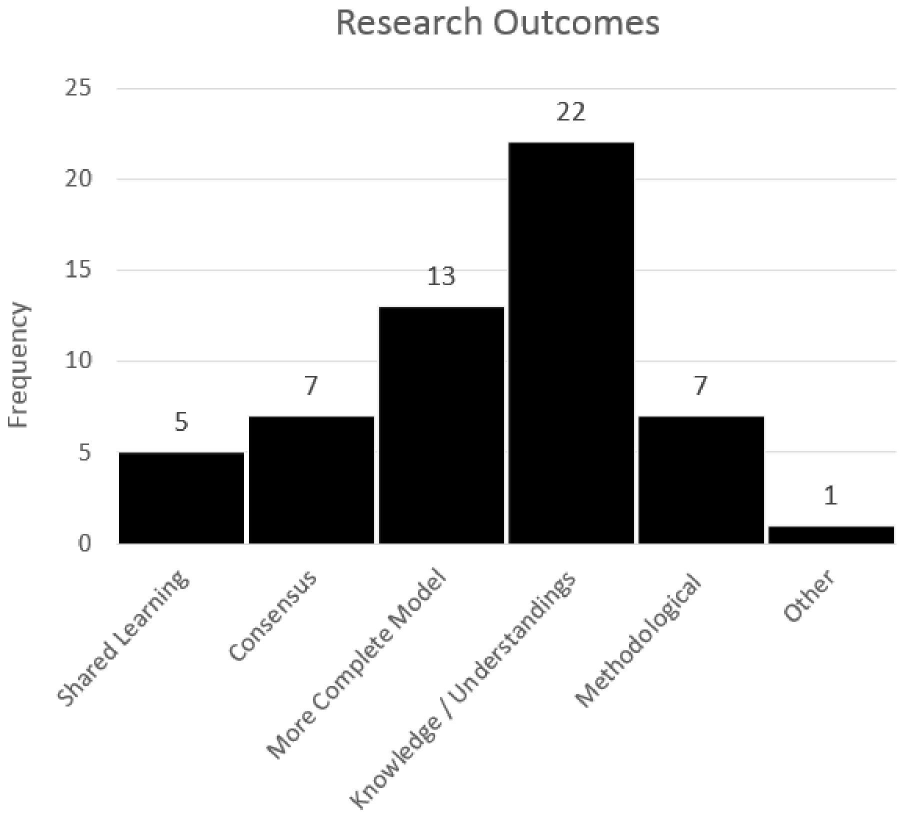
Other Analyses included:

- Principle Components Analysis
- Cluster Analysis
- Resilience Analysis
- Importance of Causal Connections

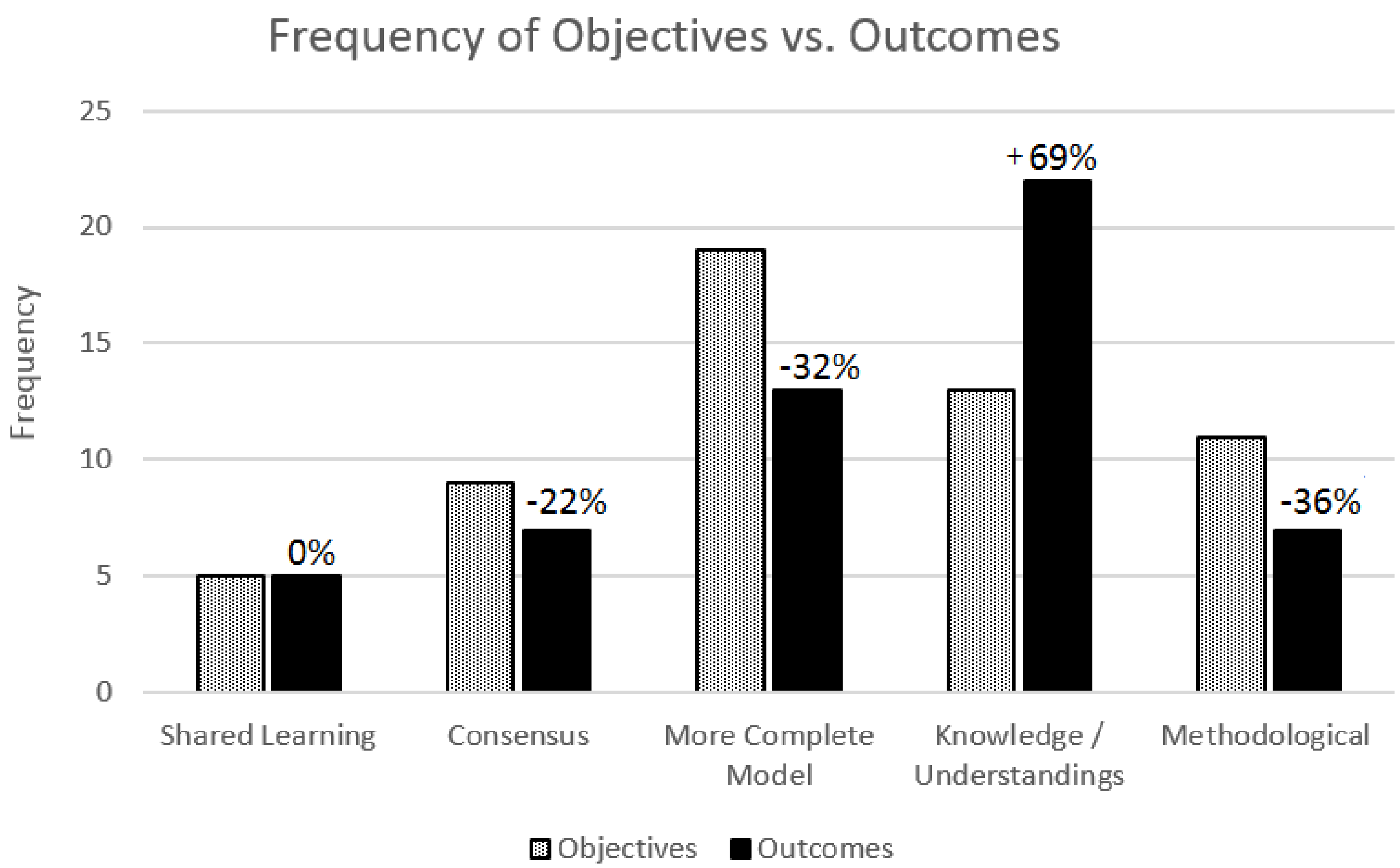
Products – Outcomes

Most Common:
Identifying and comparing participant **Knowledge and Understandings** (69%).

Creating a **More Complete Model** of the system studied (41%).



Objectives vs. Outcomes



Typologies – Participant Variation

Partnership:

Individual interviews and **model building** with **diverse groups of stakeholders**

Process:

Open concept determination, often **aggregated into group models**

Robust structural comparisons among models and **scenario analysis** to study functional differences

Products:

Very effective in studying **variation in participants' knowledge and understandings**

Participant Variation

<u>Tradeoffs/Limitations</u>:

Can be expensive and time consuming to conduct

Translation from linguistic terms introduces researcher interpretation

Ambiguity regarding some terms used may introduce error

More Complete System Model – Individual Approach

Partnership:

Individual modeling with Domain Experts, Local Experts, or Diverse Stakeholders

Process:

Open concept determination

Robust structural comparisons among models and **scenario analysis** for prediction or system behavior

Products:

Most had outcomes of a **better system model** and knowledge of **participant variation**

More Complete System Model – Individual Approach

Tradeoffs/Limitations:

Time consuming and many participants needed

Disparities in participant perspectives may introduce uncertainty in model

More Complete System Model – Group Approach

Partnership:

Group modeling with **Domain Experts**

Process:

Partially Pre-determined concepts

Scenario analysis for prediction or system behavior

Products:

Most had outcomes of a **better system model**

More Complete System Model – Group Approach

Tradeoffs/Limitations:

Power dynamics in group situations may bias model

Group knowledge alone did not produce a satisfactory model in some cases

Consensus Building

Partnership:

Individual Modeling with **Practitioners** or **Diverse Stakeholders**

Process:

Open concept determination, models typically **Aggregated** into whole system map

Analyses focus on determining most **important concepts** or **system outcomes**

Products:

Consensus outcomes were often achieved, but followup with groups to define further actions was limited

Participant Variation outcomes were common

Consensus Building

Tradeoffs/Limitations:

Merged models do not necessarily represent a real consensus achieved through group discussion/negotiation

Doubts over accuracy of model for decision-making

Shared Learning

Partnership:

Group Modeling with **Small Groups** (4-13)

Process:

Open concept determination

Scenario Analysis

Products:

Co-occurring with **Shared Learning**, **Consensus**, and **Participant Variation**

Shared Learning

Tradeoffs/Limitations:

Need good facilitation to avoid group power dynamics

Need to engage and communicate among diverse groups

Findings and Needs

1. Useful standard approaches are emerging in participatory FCM

2. Challenges related to accurately representing systems from stakeholder knowledge and effectively facilitating group modeling

3. Lack of followup and research that is directly beneficial to participants

Questions or Suggestions?

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