Communities of Practice

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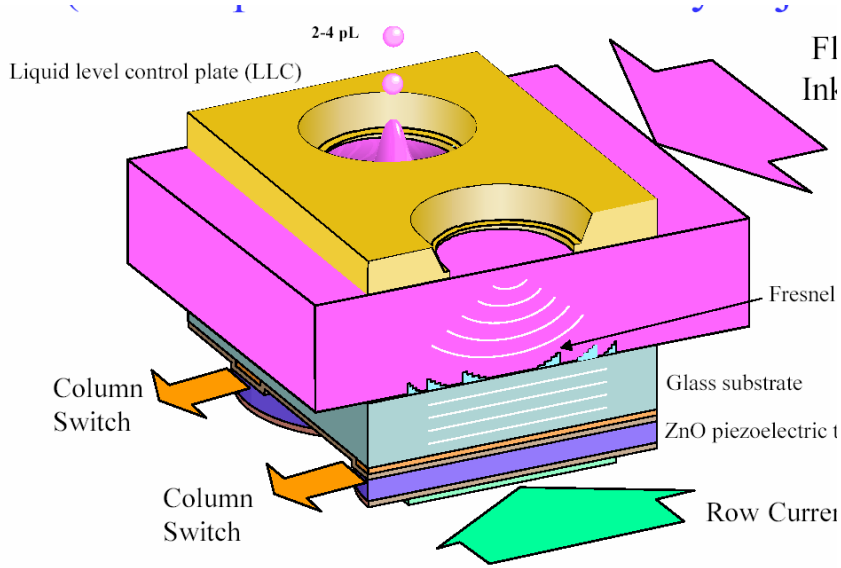
Knowledge at the Center

- Knowledge-based economy
  - Knowledge as key strategic asset
- Resource-based (in fact, knowledge-based) view of the firm
  - In search of inimitable competitive advantage
- How to create and exploit knowledge
  - Absorptive capacity

Technology Approach

- Knowledge repositories
  - Creating common organizational memory
- Skill profiles
- Groupware



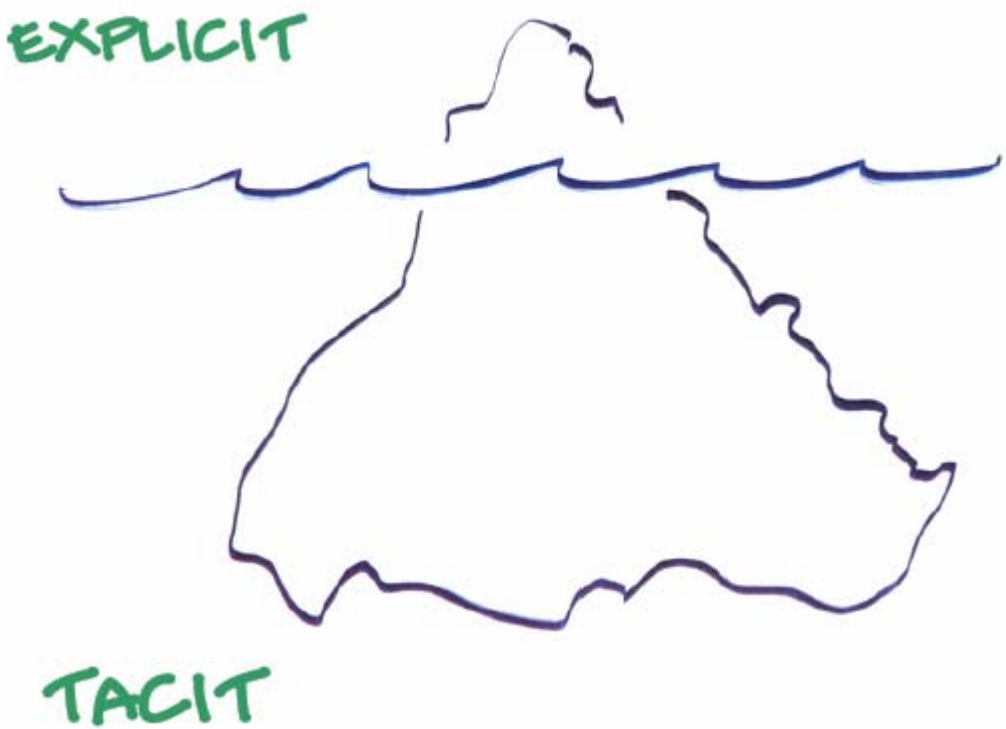
Results have been disappointing

Technology Not Enough

- Knowledge is often tacit
- Knowledge is often situated in practice
- Knowledge is often socially constructed

Tacit vs. Explicit Knowledge

- Most knowledge is tacit
  - Not codified
  - Can't be told directly
- Knowing how vs. knowing that
- Learning by managing opportunities
  - Apprenticeships
- Also via stories
  - Xerox repairmen



Knowledge as Practice

- Most knowledge is really knowing
  - Not abstract, discrete, set of independent facts or principles ("particle theory of knowledge")
  - Embedded in behavior, routines, systems
    - Contextual
    - Part of practice
- Learn by doing
  - Apprenticeships again

The Social Life of Information

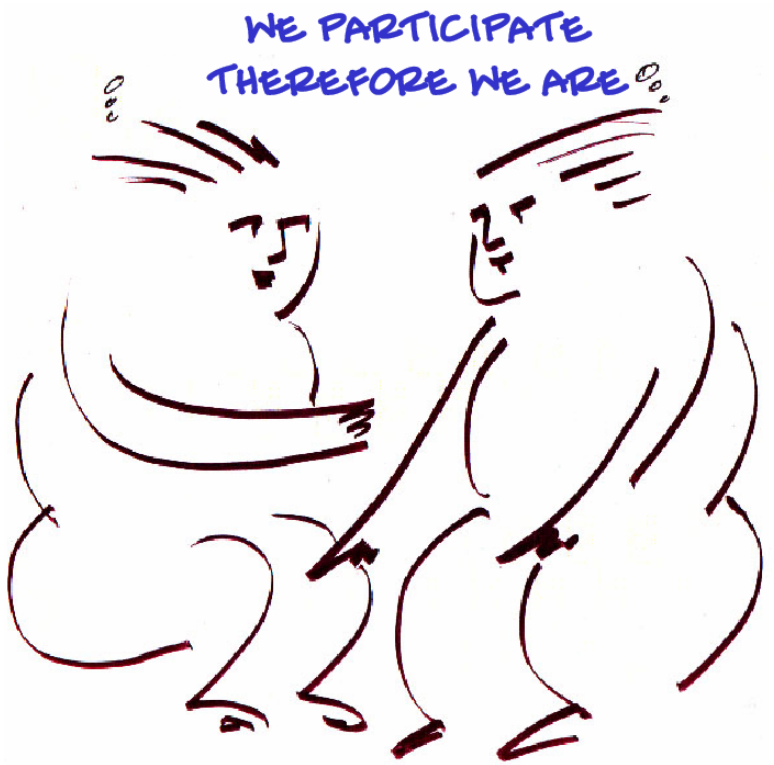
- Knowledge is mostly constructed and transmitted and held by interaction with others
  - Isolated genius is largely myth
- Learning via watching, interacting, trying, getting corrected etc.; in short: participation
  - Apprenticeships again
- Solving problems by
  - thinking aloud - explicitizing
  - Mutual aid – catching fire
  - Synthesizing solutions – like chromosomes recombining

Orr's (1990) Study of Xerox Repairmen

- Variance between formal description of work and informal ways it got done
- Technicians spent a lot of time socializing, swapping repair stories, working on machines in pairs

Communities of practice

- Lave & Wenger (1991)
- Key characteristics
  - Narration
  - Social construction
  - Mutual engagement
  - Joint purpose
  - Shared repertoire
  - Legitimate participation
- Works particularly well for functional groups in a single location
  - Claims processors
- Organizations as collections of communities of practice



Mutual Engagement

- *Mutual engagement* refers to the amount and pattern of interaction among the members of the community. Through their interactions, they shape the group's culture and it's practices. No matter how well-specified their work might appear, in fact when you examine what happens is a result of their interactions. It just emerges.
- Three important aspects of mutual engagement are
  - enabling elements: e.g., Roberta's cookies
  - diversity: complementarity and distributed cognition
  - multiplexity: joined by a variety of ties, including conflict
- Key processes are narration and social construction

Structural Characteristics

- Connectedness - In a community of practice, every member is connected, directly or indirectly, to every other member. That is, a community of practice is contained within a connected component.
- Graph-theoretic distance - Relative to organizational networks in general, communities of practice have shorter graph-theoretic distances between all pairs of members.
- Density - Relative to organizational networks in general, communities of practice have a greater density of ties.
- Core/periphery - Communities of practice have core/periphery structures rather than clique structures.

Joint Enterprise

- *Joint enterprise* refers to the common purpose that binds the people together and provides a unifying goal and coherence for their actions
- Three important aspects to attend to:
  - negotiated goals. Sometimes this joint enterprise entails elements that are not exactly what management intends. The group develops a conception of their joint goals through mutual engagement.
  - indigenous purpose. In part the goals of the group are determined by the larger structure in which they are embedded. But the group itself creates its own identity, goals, enterprise.
  - mutual accountability. The joint enterprise is not like McDonald's mission statement which is tacked on the wall and completely ignored. Because it is indigenous, and it is constructed by mutual negotiation, it creates a regime of mutual accountability. People are responsible to each other for sharing information & making each other's lives easier, and they enforce this themselves when it really is a community of practice

Shared Repertoire

- *Shared repertoire* refers to the continual development and maintenance of a shared repertoire of procedures, techniques, shortcuts, jargon, tools, forms, symbols, mental categories, actions, concepts, etc.
  - This is the most obvious outcome of a community of practice.
- Three aspects of shared repertoire are worth noting.
  - shared history. Because the repertoire is built up and shaped over time by the participants themselves, they are part of their shared history and give a sense of identity and belongingness
  - richness. The shared repertoire provides a language for communicating meaning. The larger the repertoire, the easier to express meanings because there is more to work with
  - ambiguity. How elements of the repertoire are viewed and used is always up for interpretation. For example, chairs can be viewed as just what you sit on, or as symbols of how management views the claims processing unit.

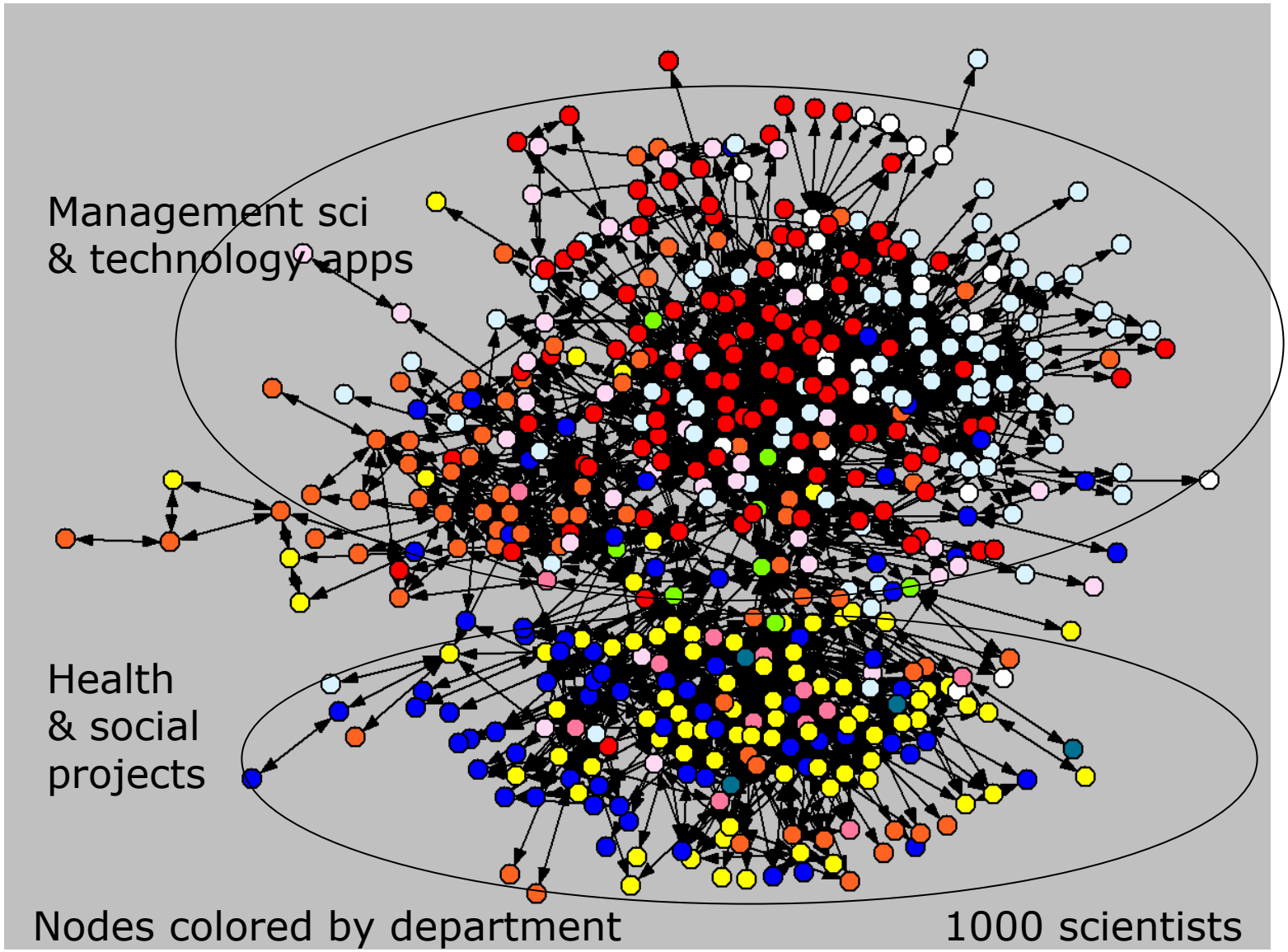
Individuals and the Group

- Levels of participation
  - Full participation (insider)
  - Legitimate peripherality (newbie)
  - Marginality
  - Full non-participation (outsider)
- Structural hypothesis
  - Coreness - The greater an individual's participation in a community of practice, the greater his or her coreness score.

Managing Communities

- Can management decree a community of practice?
- World Bank efforts
- Detecting communities through network analysis
  - Searching for dense areas in the communication or collaboration network
  - CoP have tell-tale core/periphery structure
    - Core members have the most knowledge

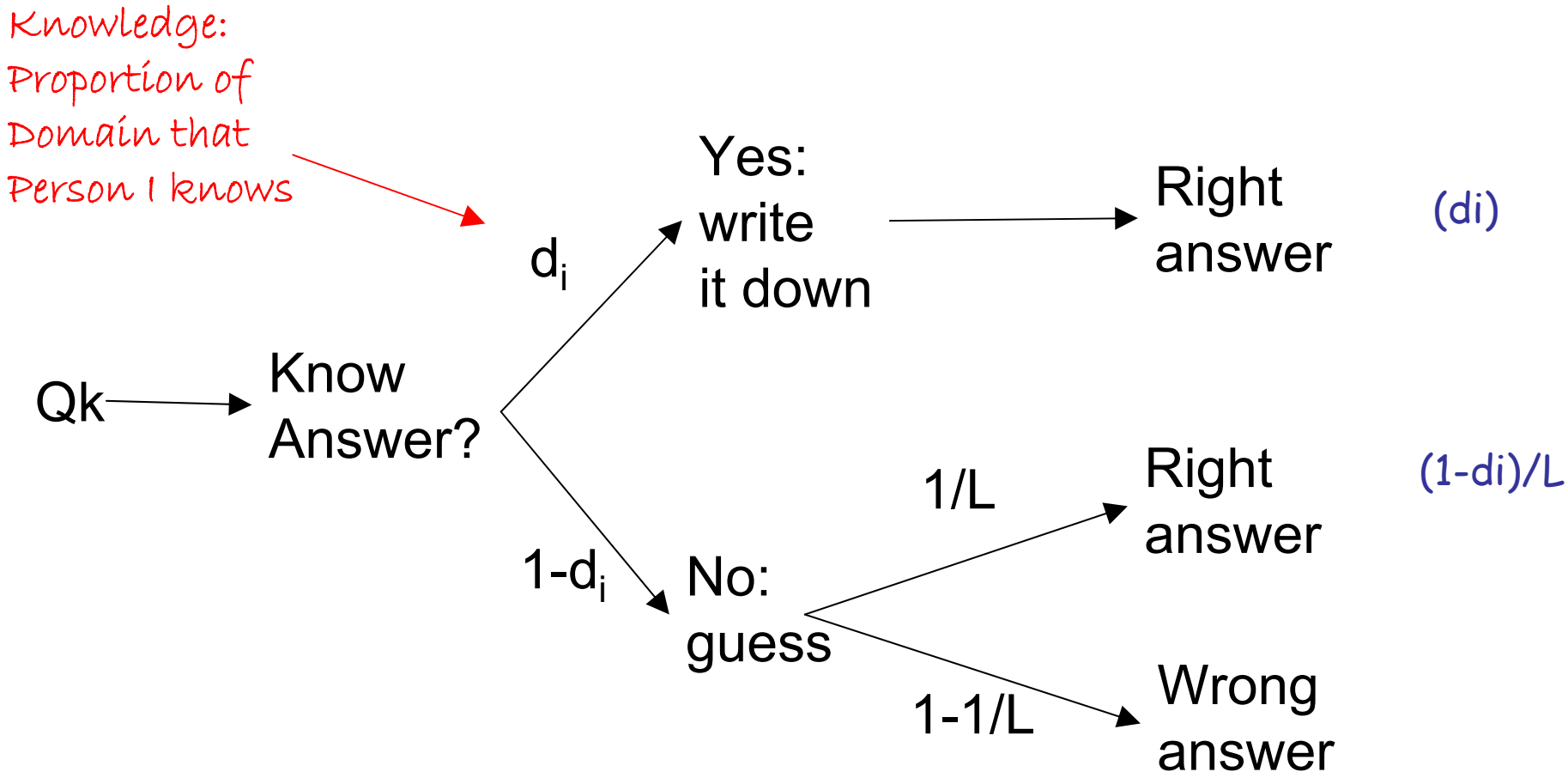
Identifying communities via project collaboration data



Consensus Modeling

- Romney, Weller and Batchelder (1986)
- Both a theory and a method
- Theory of intra-cultural variation
  - Folk belief that agreement is related to truth
    - Unanimous jury system
  - But agreement can be wrong
  - Under what conditions does agreement imply knowledge?
- Method
  - Measuring knowledge, identifying subcultures

Response model



$$Prob(correct) = m_i = d_i + \frac{(1-d_i)}{L}$$

L = # of choices
In multiple choice
question.

Prob of agreement, m_{ij}

(between respondents I and J)

Case	Probability
1. Both know answer	didj
2. I knows and J guesses right	di(1-dj)/L
3. J knows and I guesses right	dj(1-di)/L
4. Neither knows, both guess the same	(1-di)(1-dj)/L

Neither Knows, Guess Same

Person J

Person I

	1	2	…	L	
1	$(1/L)^2$				1/L
2		$(1/L)^2$			1/L
…			$(1/L)^2$		1/L
L				$(1/L)^2$	1/L
	1/L	1/L	1/L	1/L	1

$$(1/L)^2 + (1/L)^2 + \ldots = L(1/L)^2 = 1/L$$

Pairwise agreement m_{ij}

- Agreement m_{ij} is sum of four cases:

  $m_{ij} = d_i d_j + d_i(1-d_j)/L + d_j(1-d_i)/L + (1-d_i)(1-d_j)/L$
  $m_{ij} = d_i d_j + (1-d_i d_j)/L$

- Or rearrange terms:

  $(Lm_{ij}-1)/(L-1) = d_i d_j$

- Agreement between respondents is a multiplicative function of knowledge level of each

Factor Analysis

observed

unknown

- Left side of $(Lm_{ij}-1)/(L-1) = d_i d_j$ is just obs agreement adjusted by constants. If we let $m^*_{ij} = (Lm_{ij}-1)/(L-1)$ then we can write more simply: $m^*_{ij} = d_i d_j$
- We solve for d's by factor analyzing M*
  - Spearman's fundamental equation of factor analysis $r_{ij} = f_i f_j$
    - Corr between two variables is a function of the extent each is correlated with the latent factor

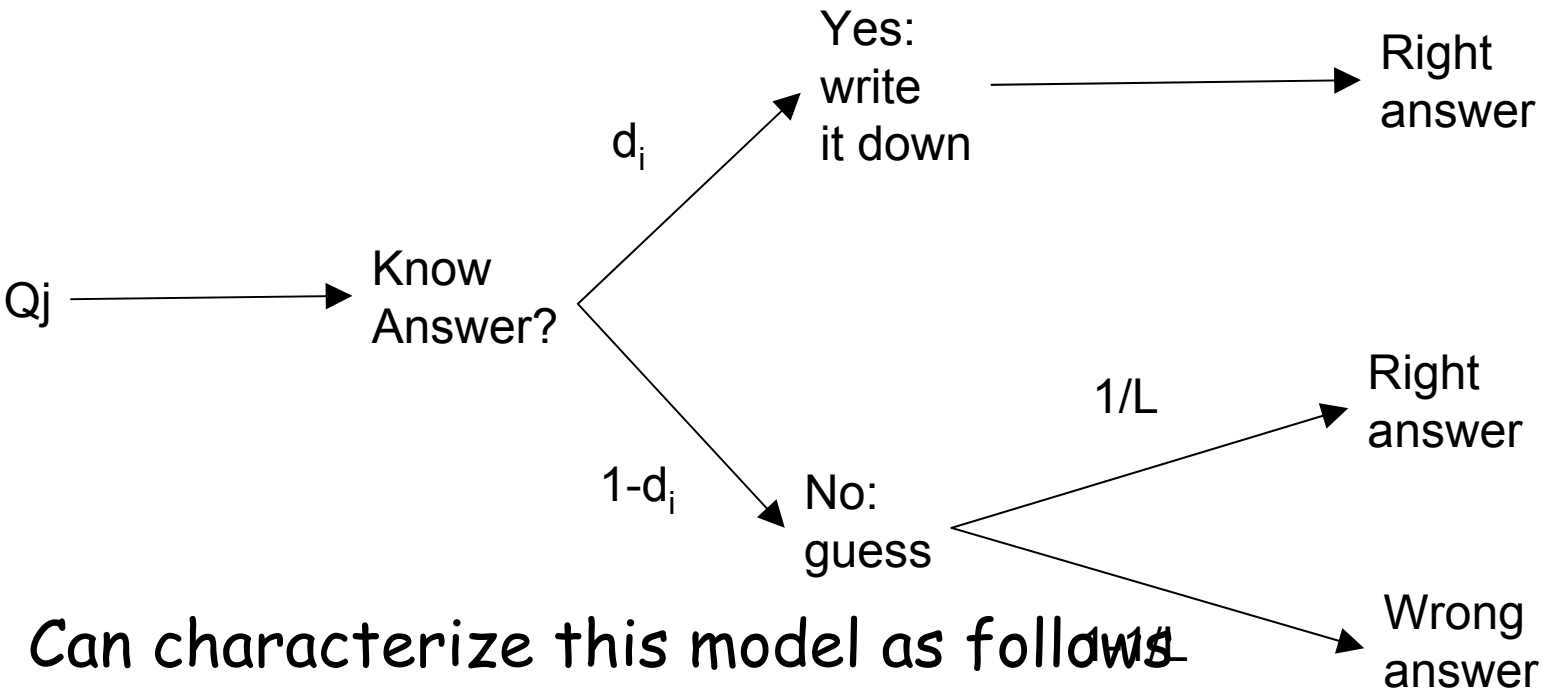
We can figure out how much people know without having an answer key !!!!!!!!!!!!

Inferring knowledge

- Factoring the observed agreement matrix M* solves for the unknown values d_i
  - The d values given by the factor loadings
- The d values are the amount of knowledge each person has
  - Literally, the correlation of the person's responses with the unknown answer key
- So factoring the agreement matrix gets us exact estimates of the amount of knowledge each person has
  - And no answer key is needed!!!
  - Exactly what we were looking for

What's the catch??

- The response model must be right



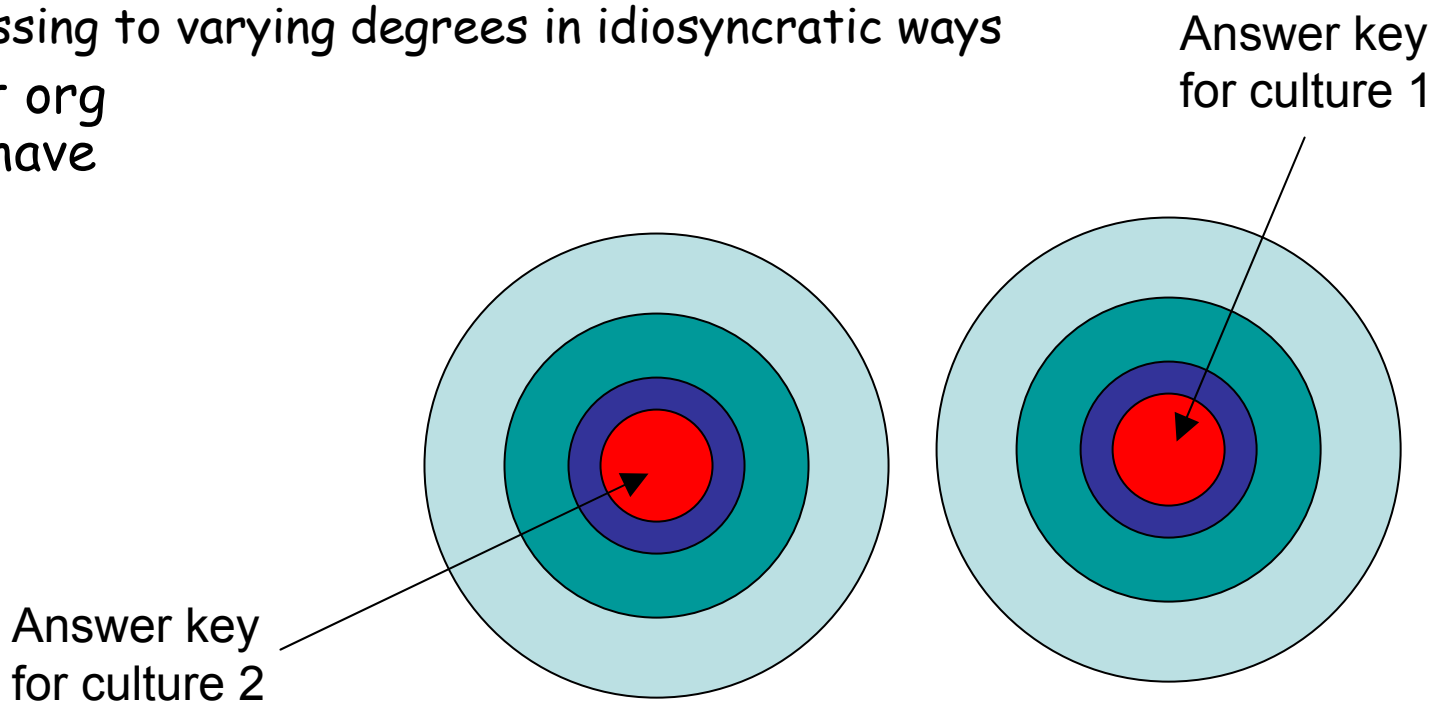
- Can characterize this model as follows

Three conditions

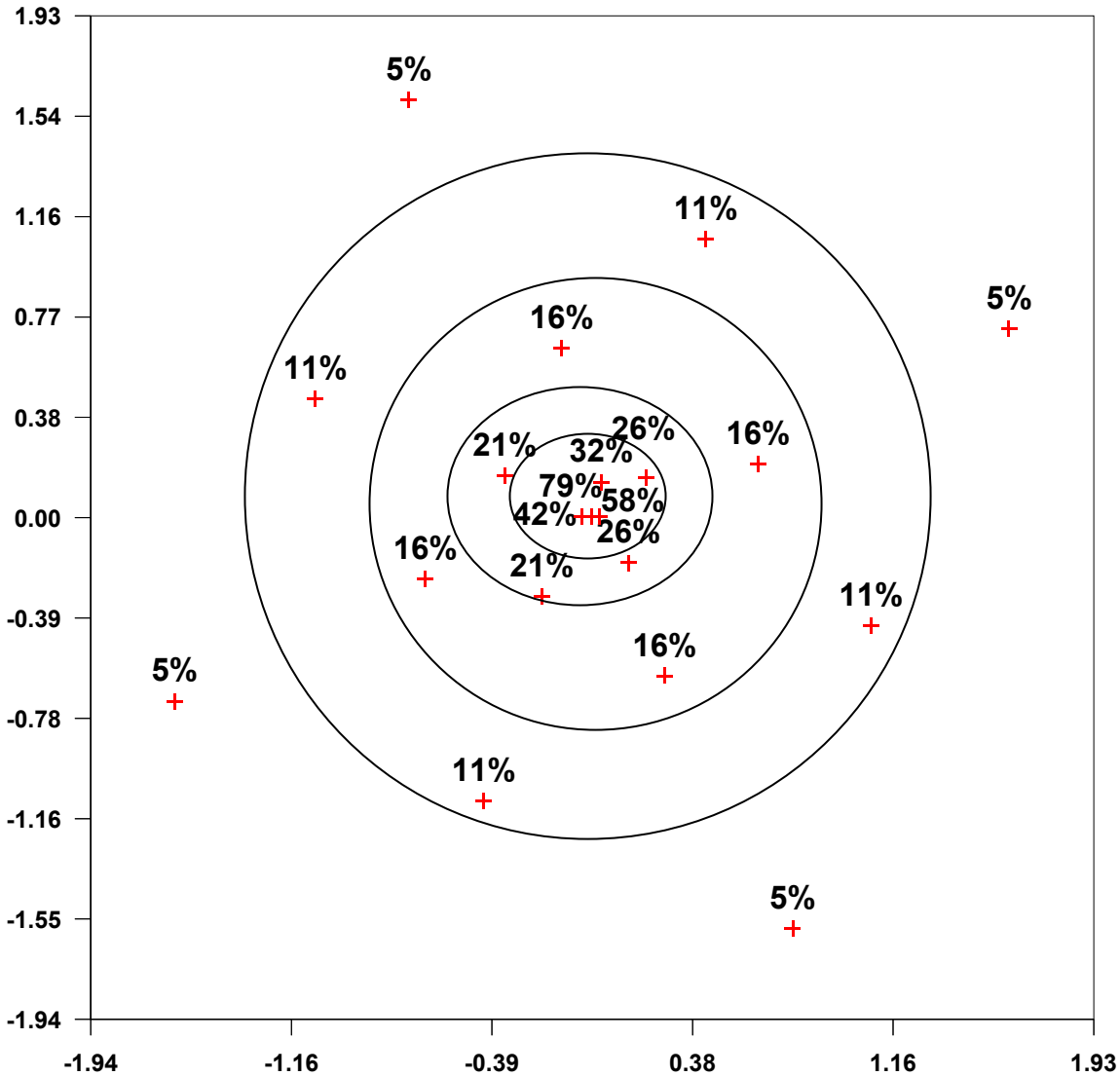
- Common Truth
  - each question has exactly one right answer, applicable to entire sample of respondents
    - Sample drawn from one pop w/ same answer key
- Local Independence
  - resp-item response variables x_{ij} are independent, conditional on the truth
- One Domain
  - All questions drawn from same domain, i.e.:
    - can model knowledge w/ one parameter, d_i

Bullseye Model

- Two people agree to the extent that each is correlated with the truth
  - Truth is culturally correct answer key
- Each member of culture is aiming at same answer key
  - but missing to varying degrees in idiosyncratic ways
- Different org cultures have different targets



Expected Agreement Pattern



Partitioning variability

- Model identifies two sources of variability in responses (beliefs)
  - Cultural: multiple answer keys
  - Individual: variation in knowledge
- Within each culture, we still expect (and can measure), variability due to differential access to information, ability, etc.

Test of consensus model

- Undergraduate class with 92 students
- Multiple choice final exam with 50 questions
- Instructor's answer key provides gold standard to compare against
- Each student asked to guess test score of all acquaintances, including self

Measures

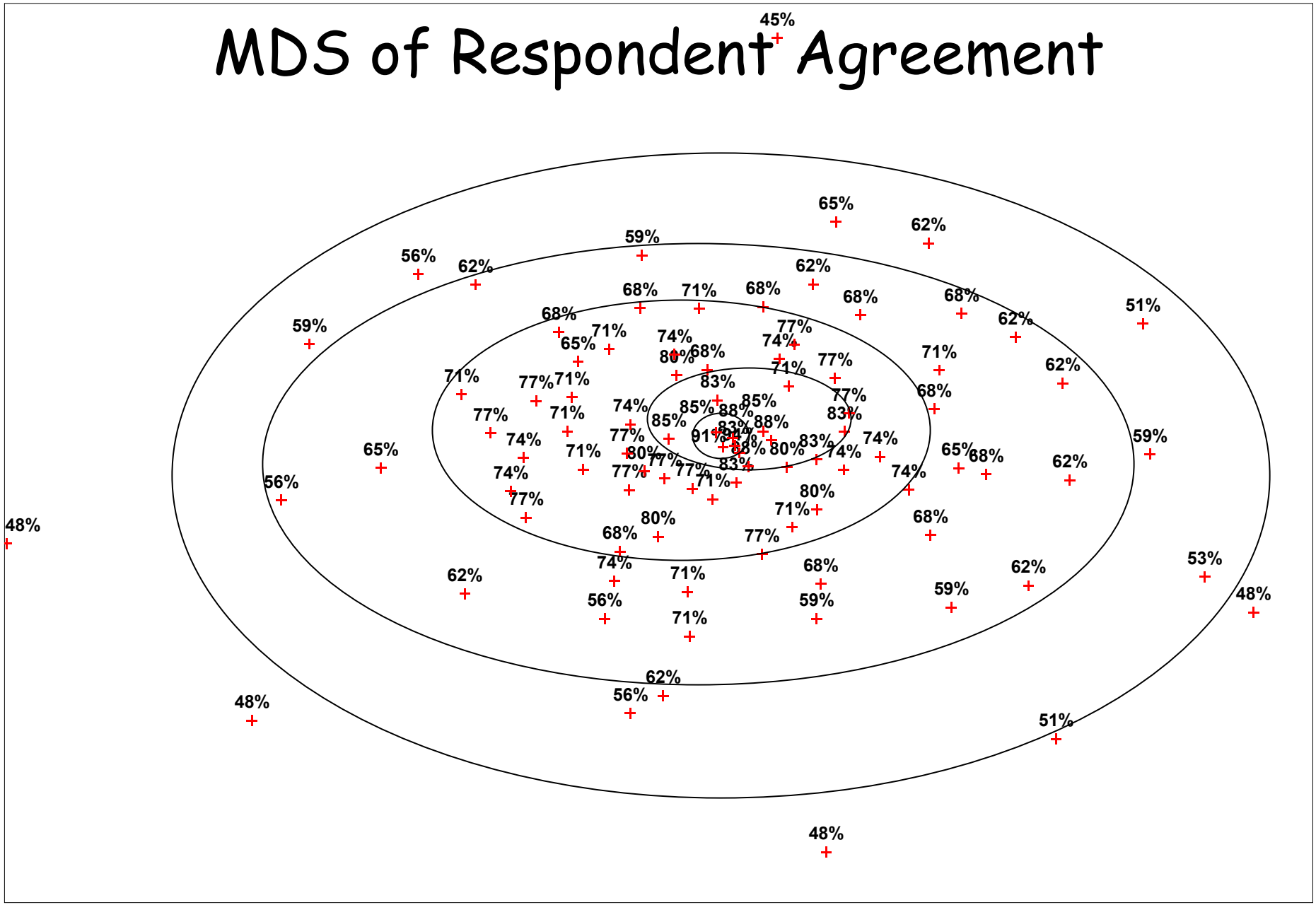
- Self-report model
  - Each person's estimate of their own score
- Network model
  - for each person, use average estimate of their scores (persons with fewer than 5 acquaintances were excluded)
    - All acquaintances
    - Only friends
- Consensus model
  - Factor loadings of minimum residual factor analysis of student-by-student agreement matrix
- Gold standard
  - % correct based on instructor's answer key

Factor Analysis of Agreements

Factor	Eigenval	Percent	Cum %	Ratio
1	51.323	93.6	93.6	28.308
2	1.813	3.3	96.9	1.065
3	1.702	3.1	100	

- Results consistent w/ single answer key
  - therefore we can use loadings to estimate knowledge

MDS of Respondent Agreement



Correlations

	Gold	Self	Acquaint	Friends	Consen
Gold	1.000				
Self	0.479	1.000			
Acquaint	0.334	0.564	1.000		
Friends	0.398	0.556	0.891	1.000	
Consen	0.947	0.471	0.342	0.400	1.000

- Consensus estimates virtually identical to gold standard (r = 0.947)
- Self-report better than network model