

Collaborative Sensemaking in Online Knowledge Groups



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Motivation



“This information seems relevant, but what does it mean?”

Finding information —→ Making sense of it

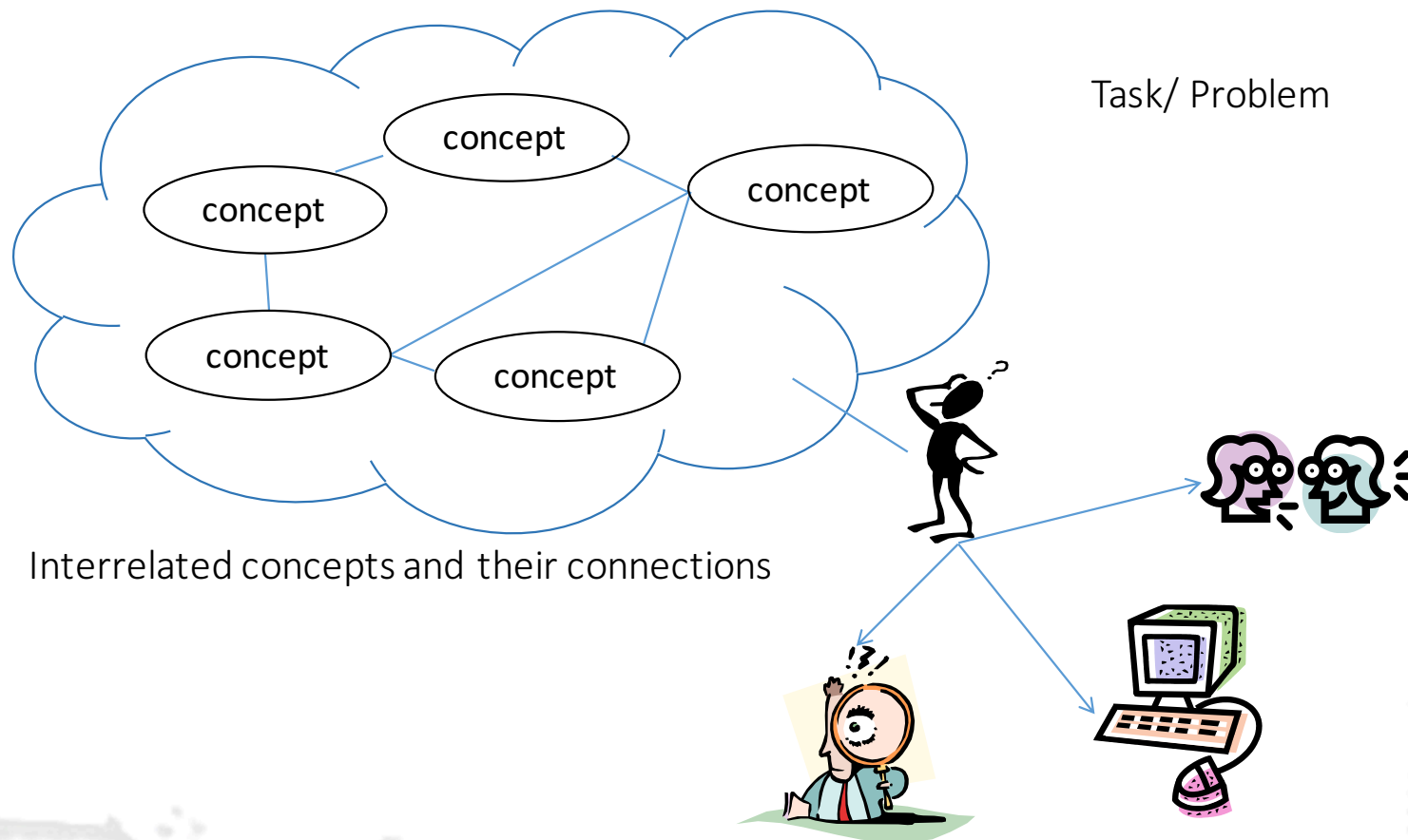
Beyond information retrieval, **supporting users in making sense** of the information found is the next frontier in information research.

What is Sensemaking

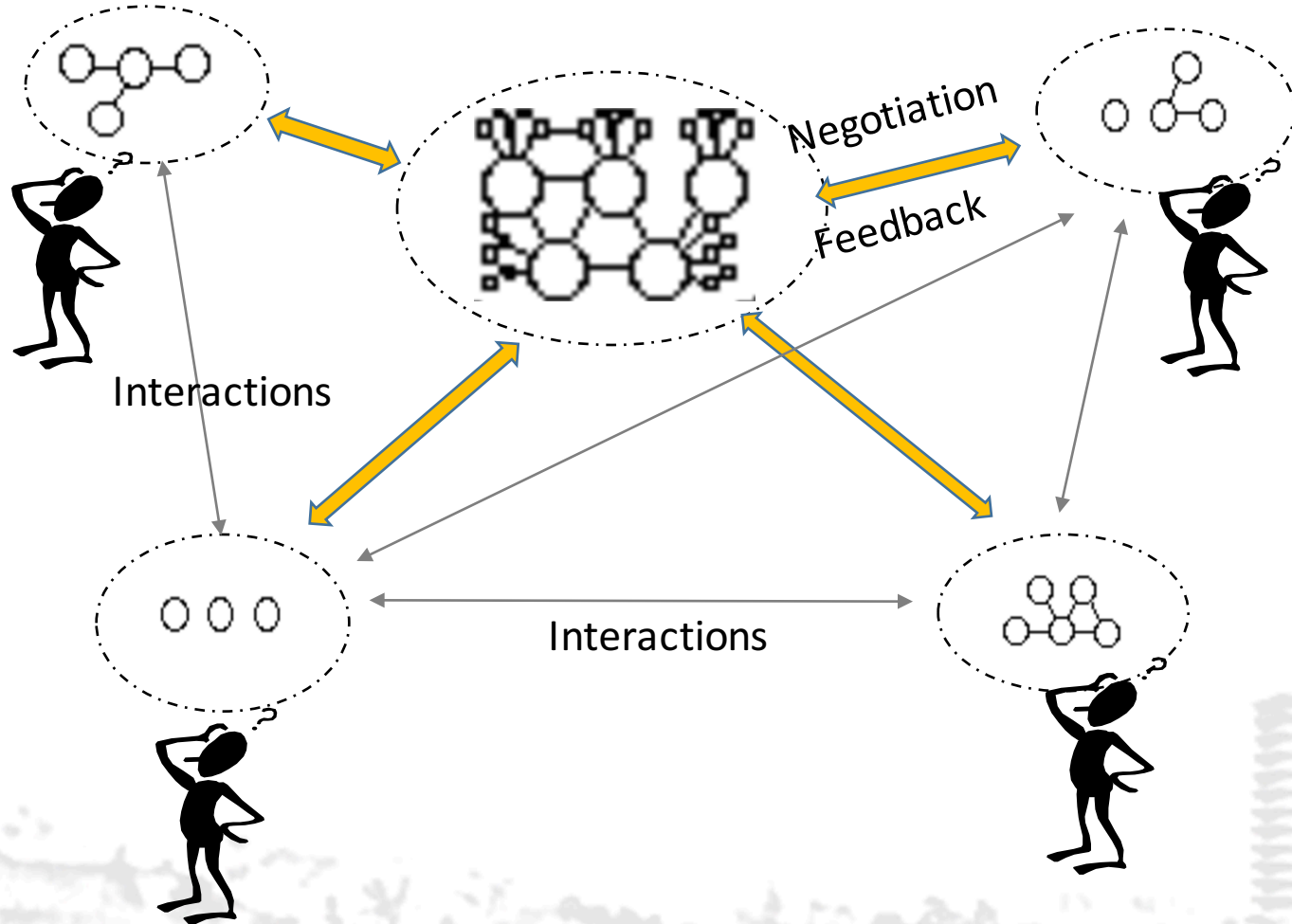


- Sensemaking is the task of **creating an understanding of a problem or task** so that further actions may be taken in an informed manner. (Stefik, 1999)
 - An important part of sensemaking involves making clear the interrelated **concepts and their relationships** in a problem or task space
- Sensemaking is particularly important in
 - New situations
 - Less structured tasks
 - Collaborative settings

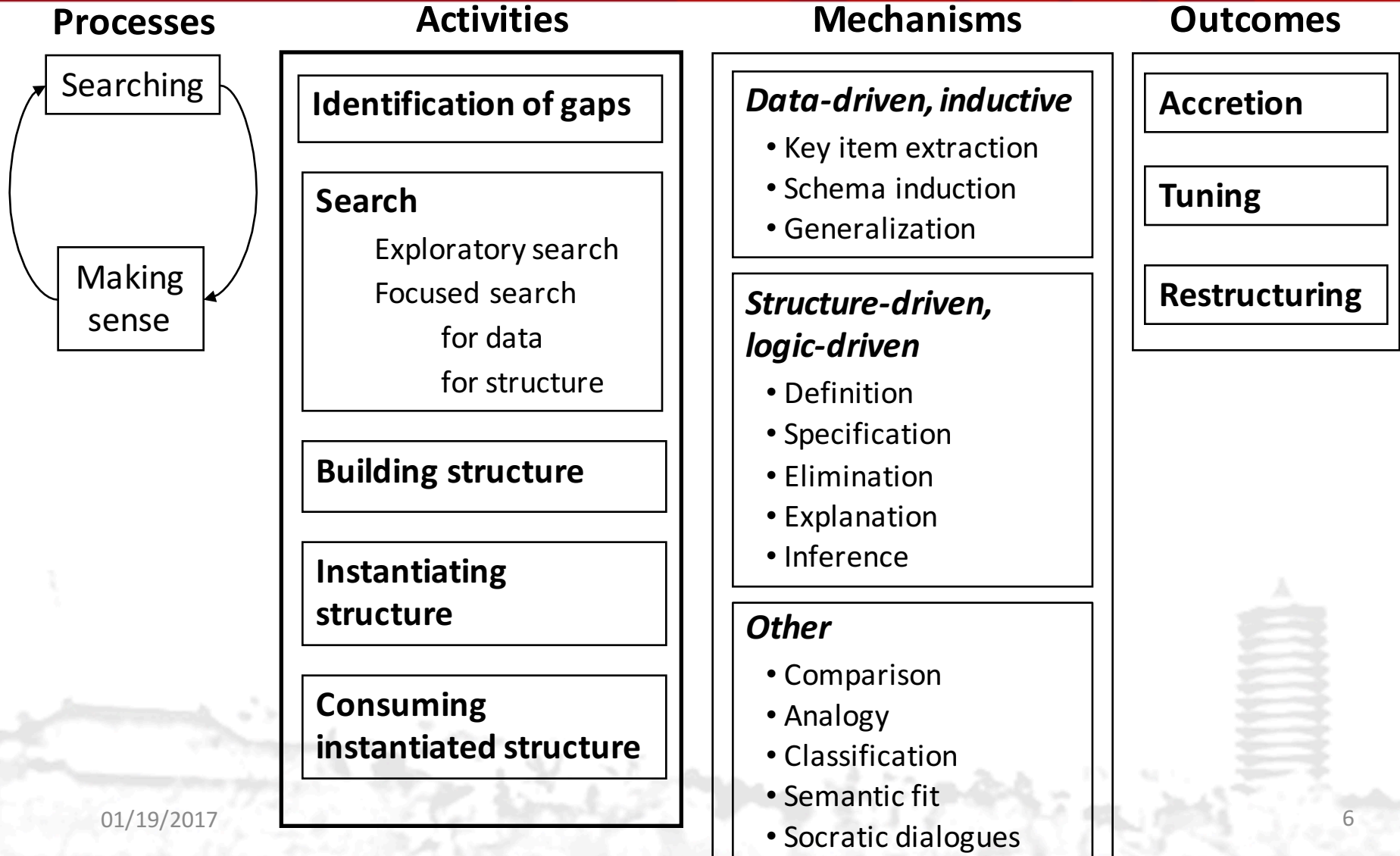
Individual sensemaking



Collaborative sensemaking



Sensemaking Elements



Building and Instantiating Structure



(Russell, 1993)

- **Building structure:** creating structural representations of knowledge , for example:
 - Organizing concepts and relationships in a concept map
- **Instantiating structure:** fitting data into the structure created, for example:
 - Linking facts to a concept in a concept map

Research Question



- “How do people build knowledge structures and instantiate the structures with data collectively in online knowledge groups?”
 - What activities are involved and how they proceed in sequence?
 - How are conflicts, inconsistency, and abnormality handled?
 - What are the roles and division of labor in coordinating group sensemaking?

Research Design



	Study I: Topic hierarchy construction on a social QA site	Study II: Topic discussion in an online course group wiki
Sensemaking focus	Structure building	Structure building and instantiation
Task	Constructing a topic hierarchy	Writing a report about certain topic
User group	Online QA community (zhihu.com)	Student study group
Group size	Medium to large	Small
Nature of data collected	Quantitative log data, including: <ul style="list-style-type: none"> • Topic hierarchies of selected areas • Topic history log recording: addition, deletion, modification of relationships, username, and a time stamp • Topic information (questions, answers, related user activities) • User profiles 	Qualitative data including: <ul style="list-style-type: none"> • Offline discussion recordings • Wiki editing history • Final report • Other communications including emails, IM messages, etc.

STUDY I: Social Creation of a Topic Hierarchy



- Disciplines (5)
 - ◆ Social sciences (23)
 - Politics (8)
 - Political sociology (13)
 - Elitism (0)
 - Social class (13)
 - *View all*
 - Institution (5)
 - *View all*
 - Journalism and Communication (2)
 - Communication (5)
 - Journalism (9)
 - Sociology (26)
 - Political sociology (13)
 - Ethnosociology (7)
 - *View all*
 - Economics (50)
 - *View all*
 - ◆ Natural sciences (9)
 - Chemistry (36)
 - Environmental science (1)
 - Biology (33)
 - *View all*
 - ◆ Formal sciences (4)
 - Logic (4)
 - Theoretical computer science (7)
 - Statistics (32)
 - Math (59)
 - ◆ Humanities (16)
 - Arts (2)
 - Filmology (0)
 - *View all*
 - ◆ Technology and applied sciences (31)
 - Optics (14)
 - Medical science (35)
 - *View all*

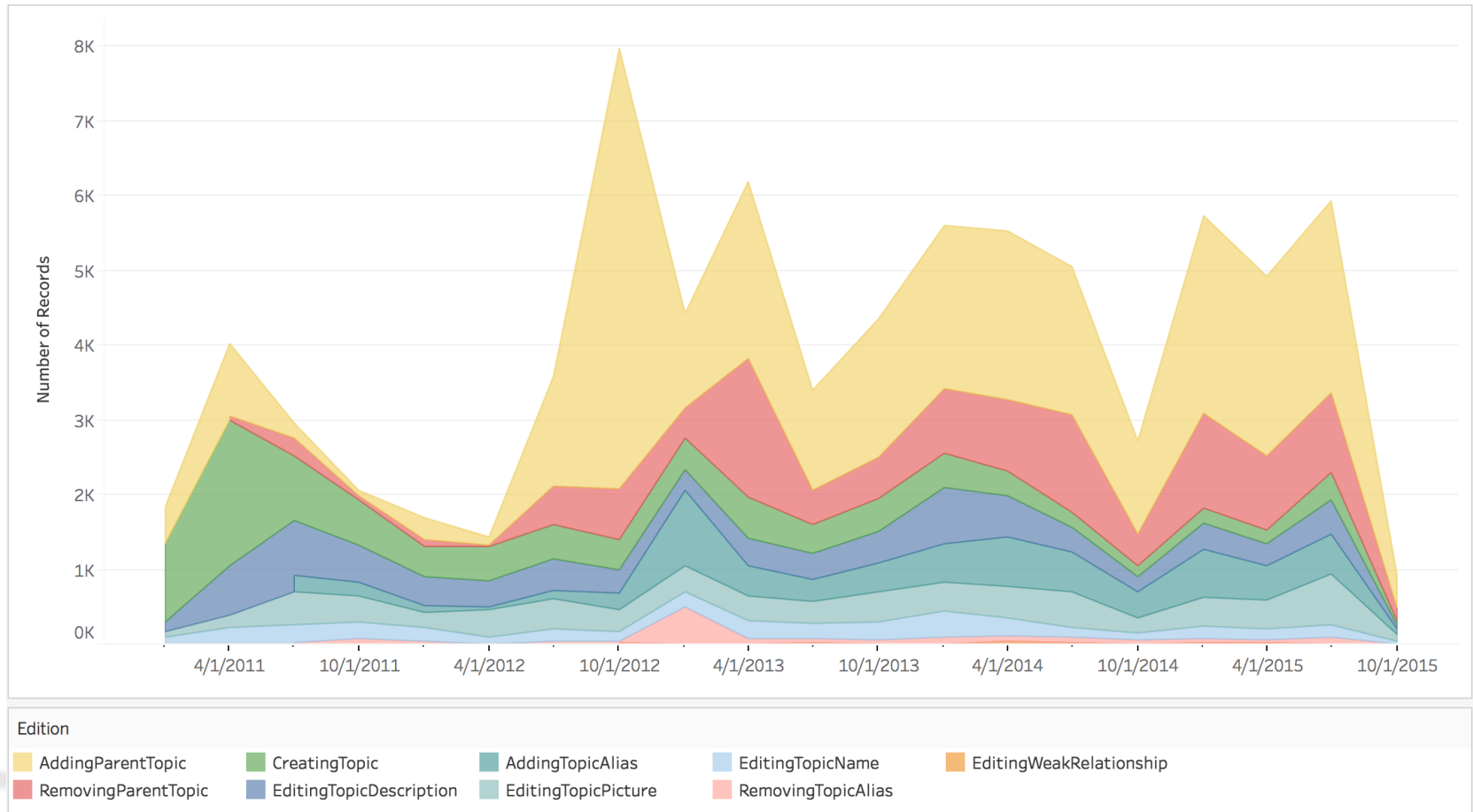


Types of Structure Building Activity

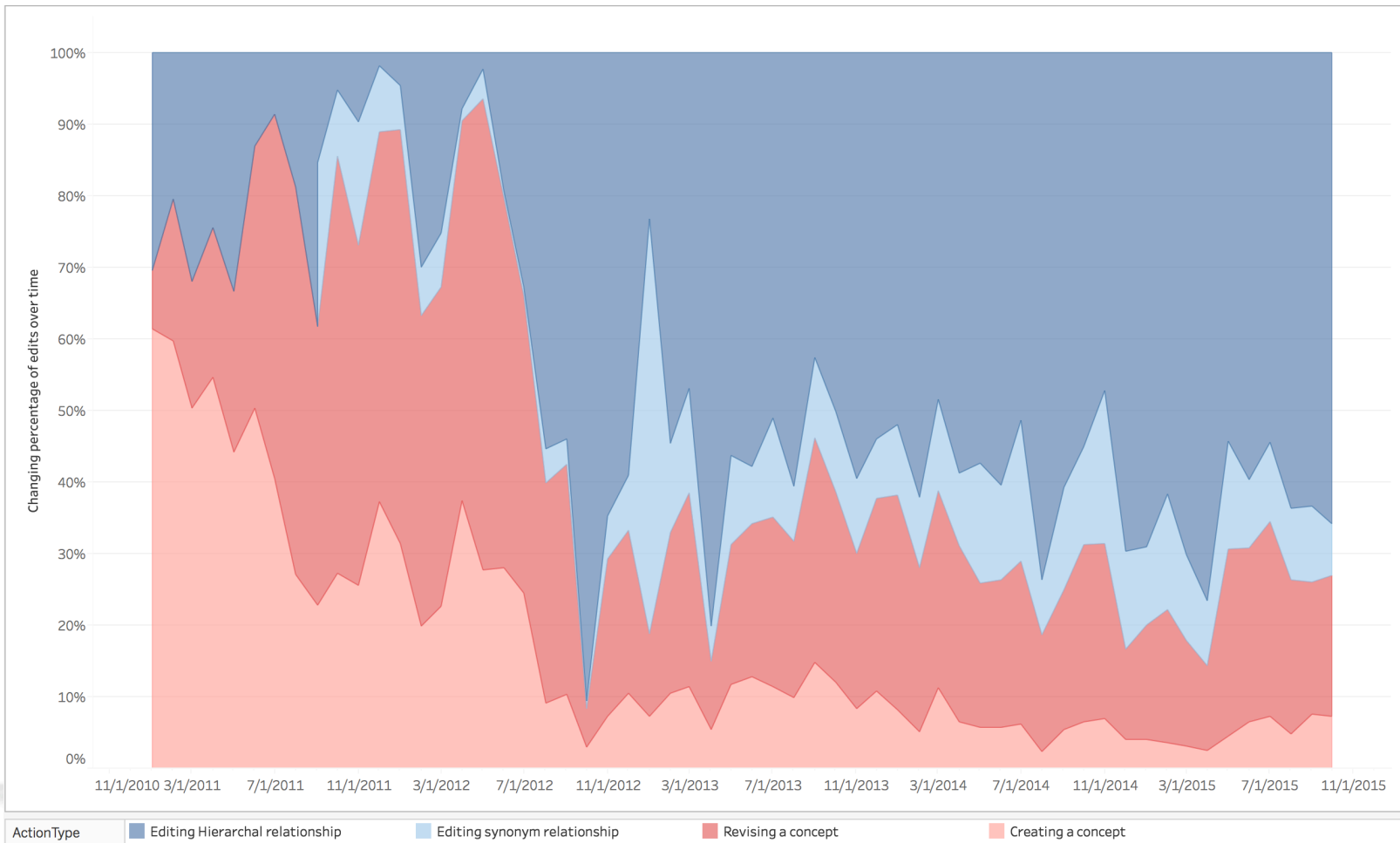
Concept edits	Creating a concept	Creating topic
	Revising a concept	Editing topic description
		Editing topic name
Relationship edits	Editing synonym relationship	Editing topic picture
		Adding topic alias
	Editing hierarchal relationship	Removing topic alias
		Adding parent topic
		Removing parent topic
		Editing weak relationship

#LogID	Username	Action	Topic 1	Topic 2	Date	Time
378	胡**	Creating topic	Mobile Internet		2010/12/20	8:25:44
91672	V**	Editing topic description	Mobile Internet		2011/03/18	13:22:14
1091333	奚**	Adding topic alias	Mobile Internet	Wireless Internet	2011/09/08	17:31:28
4203756	陈**	Adding parent topic	Mobile Internet	Windows Phone 7	2012/09/18	9:50:46
4203758	陈**	Removing parent topic	Mobile Internet	Windows Phone 7	2012/09/18	9:50:51
4279564	张**	Editing topic picture	Mobile Internet		2012/09/25	20:58:20

Types of Structure Building



Concept vs. Relationship Edits

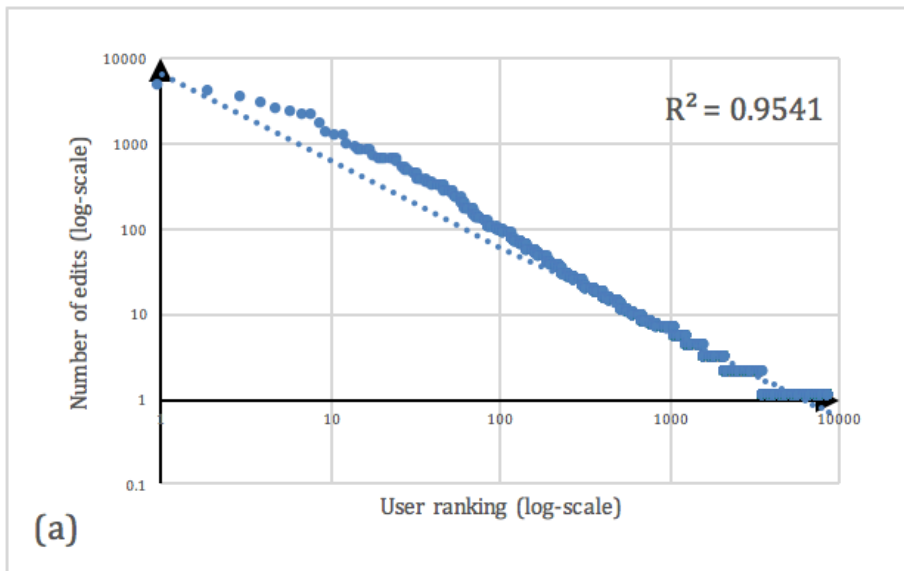


Conflicts in constructing the structure

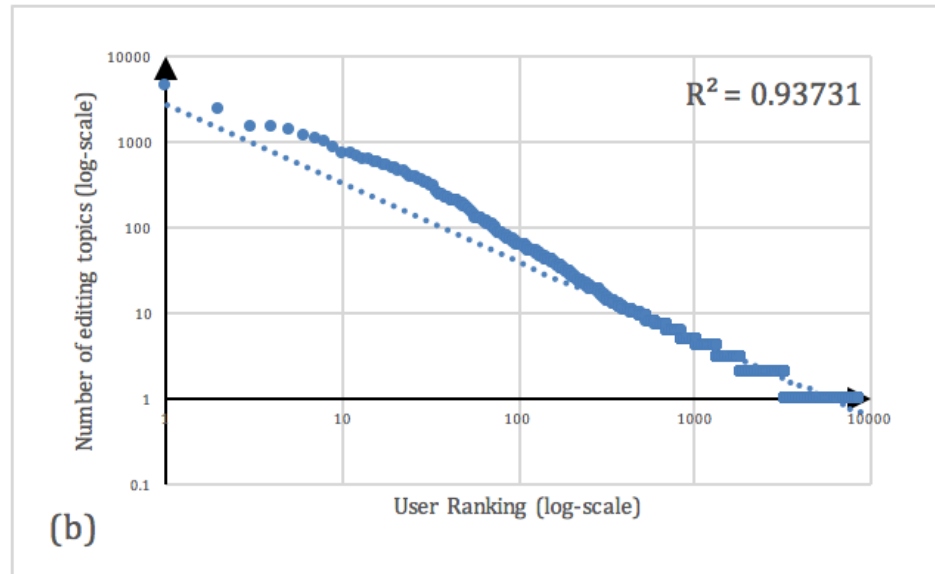


# of relationships		28,283
No conflicts	Edited once	19261 (68.1%)
	Edited more than once by the same person	2263 (8%)
Conflicts		6,759 (23.9%)
		Removed 6123 (90.6%)
		Kept 636 (9.4%)

User participation and roles

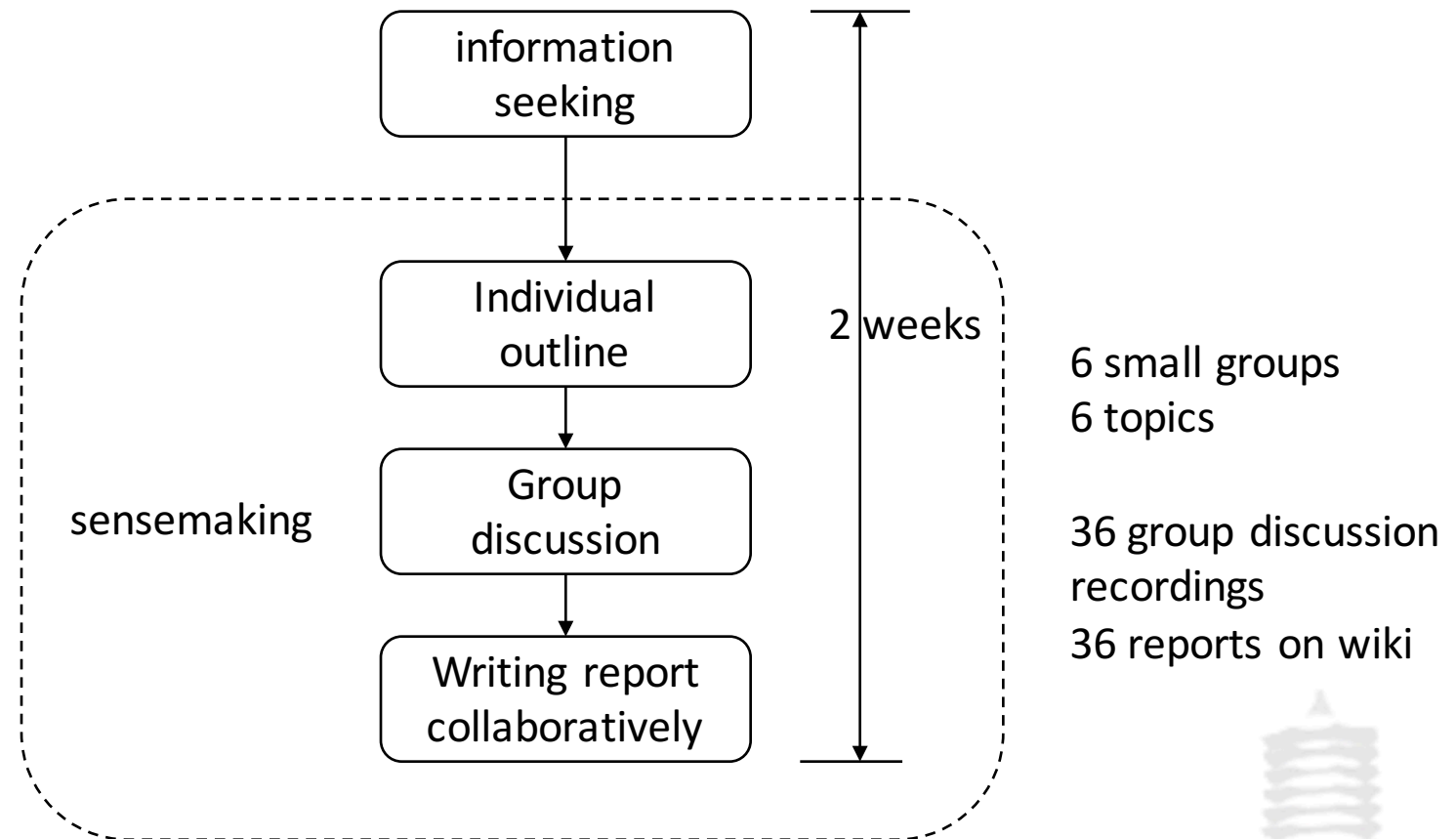


(a) distribution of users' edits;



b) distribution of user edited topics

STUDY II: Small Group Collaboration



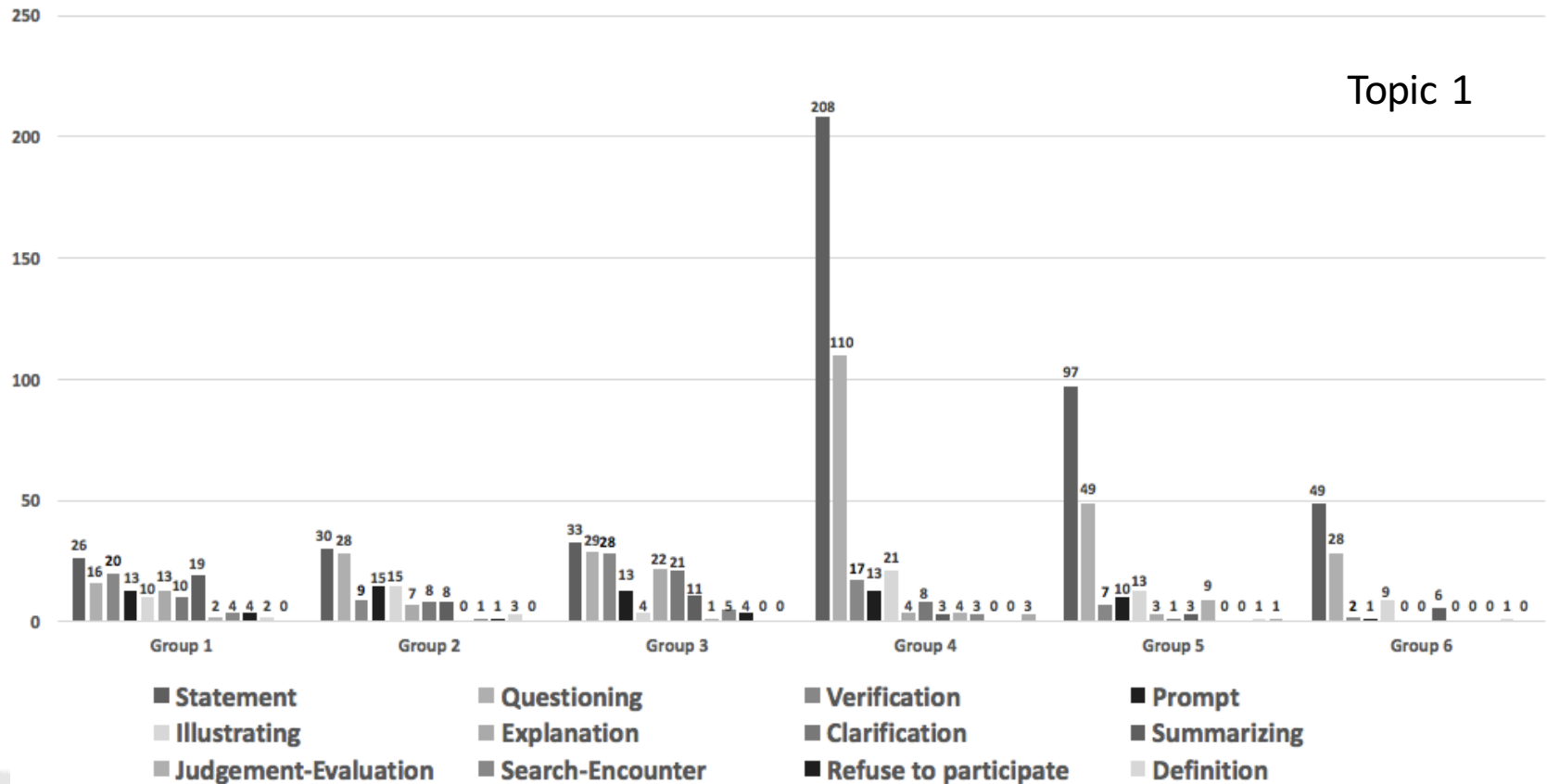


Analysis of discussion recordings

		Topic 1			Topic 2			
		# of Participants	Length (min)	# of Sub-sessions	# of Participants	Length (min)	# of Sub-sessions	
Group	1	11	94	5	10	35	4	Topic 1: FRBR Topic 2: Folksonomy
	2	12	64	5	11	36	4	
	3	11	69	5	11	35	4	
	4	12	71	5	12	38	6	
	5	10	62	5	10	41	4	
	6	10	47	5	10	19	4	
Average		11	68	5	11	34	4	

	Label	Definition
A1	Questioning	Asking for information; challenging someone's opinion
A2	Statement	Expressing opinions or attitudes towards facts or opinions
A3	Summarizing	Summarizing the content of previous discussion
A4	Illustrating	Providing examples in order to make opinions understandable or valid
A5	Verification	Making sure a former statement is true or correct
A6	Clarification	Giving further description or explanation to avoid confusion
A7	Explanation	Explaining reason or cause of something
A8	Definition	Defining a concept using technical terms
A9	Judgment-Evaluation	Judging or evaluating the quality of someone's statement or opinion
A10	Refuse to participate	Refusing to take part in sensemaking process when prompted
A11	Prompt	Moving the discussion forward by encouraging someone to talk
A12	Search-Encounter	Assisting the process of sensemaking by finding data or proof
A13	Digress	Speaking about something different from the main subject discussed

Sensemaking Activity Patterns





Sensemaking Sequence Patterns

- Verification and Clarification always appear in pairs
 - A1: *You mean it has no vocabulary control?* [Verification]
 - A4: *Yes, exactly. So I mean, without vocabulary control these tags are useless, which will result in inefficiency of the folksonomy.* [Clarification]
- Questioning, Statement, Verification, Clarification and Summarizing often take place in sequence
 - C1: *What pieces could be classified into new work or new expression in this graph? And why?* [Questioning]
 - C7: *I think a novel and a film with subtitles are new works, and the others are new expressions.* [Statement]
 - C1: *Really?* [Verification]
 - C7: *Changes in authorship and content is my standard.* [Clarification]
 - C12: *Well, so actually the novel is a new work while the translation version of a novel is the same work.* [Summarizing]

Conflicts and agreement



Activity	Agreement		Conflict		Total
	N	%	N	%	
Statement	79	61%	50	39%	129
Questioning	26	68%	12	32%	38
Illustrating	16	76%	5	24%	21
Summarizing	14	93%	1	7%	15
Prompt	9	64%	5	36%	14
Judgment-Evaluation	8	100%	0	0%	8
Verification	7	54%	6	46%	13
Clarification	5	45%	6	55%	11
Explanation	5	56%	4	44%	9
Search-Encounter	2	100%	0	0%	2
Digress	1	50%	1	50%	2
Definition	1	100%	0	0%	1
Refuse to participate	0	-	0	-	0
Total	173		90		263

Dealing with conflicts



- **Agreement => Reinforcement**
 - “Of course, *that’s what I thought.*”
- **Compensatory => Acceptance**
 - “I did not know that... *It is good to know.*”
- **In-conflict-with => sometimes persuasion, but more often doubts and confusion**
 - I am **not sure about this**. Let’s check with the teacher/TA
 - This is **confusing**. Let’s come back to it later.

Summary



- Process:
 - At the beginning: of a collaborative sensemaking process to build structures, more attention is to identify the concepts involved in the task/problem, whereas later on focus shifts to examining relationships
 - Smaller groups have different patterns of combination of sensemaking activities that moves the process along
 - Some activities are more likely to proceed in sequence (for example, statement-verification)
- Dealing with conflicts:
 - In zhihu, Conflicts are mostly like to result in removal of a relationship under discussion (90.6%)
 - In smaller groups, there are more opportunity to solve disagreement but very often it lead to confusion or failure in sensemaking

Implications



- In collaborative information seeking and sensemaking tasks:
 - It is important to be able to share “senses made” (knowledge structure instantiated with data) among group members in addition to share information found
- For collaborative systems:
 - The ability to show and communicate about the differences and disagreements might lead to more successful sensemaking



Ongoing and future directions

- Examining user roles in both studies
 - STUDY I:
 - domain experts vs. classification experts
 - STUDY II: (looking at both discussion and writing)
 - Content:
 - Building structure (theorists)
 - Instantiating structure
 - Process: facilitators
 - Leader vs. follower

Thank you!



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