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How to cite:

Selvin, A. and Buckingham Shum, S. (2008). Narrative, Sensemaking, and Improvisation in Participatory Hypermedia Construction. In: Sensemaking Workshop, CHI 2008: ACM Conference on Computer-Human Interaction, 5-10 Apr 2008, Florence.

For guidance on citations see [FAQs](#).

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Version: Accepted Manuscript

Link(s) to article on publisher's website:

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# Narrative, Sensemaking, and Improvisation in Participatory Hypermedia Construction

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## ABSTRACT

In this paper we describe research into a form of practitioner sensemaking in the context of participatory hypermedia construction sessions, in which groups of people build knowledge maps. We discuss how constructs from narrative theory and improvisation have helped us understand what happens at the moments when practitioners encounter dilemmas and obstacles. We provide brief examples from case studies and discuss possible contributions to broader themes in sensemaking research.

## Author Keywords

sensemaking, narrative, improvisation, grounded theory, hypermedia.

## ACM Classification Keywords

H.5.4 Hypertext/Hypermedia – theory, user issues; H.5.3 Group and Organization Interfaces – computer supported collaborative work.

## INTRODUCTION

Our research studies practitioners who use hypermedia software to provide support to groups through constructing graphical representations in real time. Our work in this area is one stream of a broader effort in hypermedia discourse research, which concerns understanding and practicing the co-evolution of new digital media and practices for discussing and arguing about problems. We are working on conceptual foundations for hypermedia discourse from a number of different angles, examining the expressive requirements for formal representations, the new genres of 'document' that can emerge, and ways to articulate the literacy and artistry that can emerge through the expert use of such media. This work has resulted in a number of

projects, interventions, and toolsets, including among others the Compendium knowledge mapping software [4], the Open Sensemaking Communities project as part of the OpenLearn initiative [7], and over 500 facilitated sessions in corporate, academic, and public settings using Compendium.

With regard to the concerns of this workshop, we are particularly interested in how the human experience of both practitioners and participants in such sessions culminates in what happens at their shared interface -- the representations they create with the software. Such work, often occurring in pressured situations, is rife with dilemmatic moments [1] that give rise to sensemaking instances [6], when both practitioners and participants encounter obstacles that require them to find their way again in order to move forward. The act of trying to work with hypermedia software with a roomful of people watching every move is fraught with a "density of decision points" [9] where sensemaking can be both observed and practiced. Mappers are concerned with capturing the discussion as it happens as well as with crafting a readable and expressive knowledge map in real time. This requires a host of snap decisions about form and content. The density is compounded by the fact that the knowledge mapping artifact itself is meant to serve as a sensemaking aid for the participants – a resource that helps them orient to the ongoing discussion, find connections to previous contributions, and create representations of their problem situation. The practice of constructing hypermedia knowledge maps in such situations requires a considerable confluence of skills. These include the ability to decide how to map each contribution as it occurs, fitting them into the overall structure (which may extend over many individual maps), evolving the structure on the fly, finding relevant previous material, incorporating images and documents from external sources, and keeping the whole coherent and in keeping with the intent of the session.

Close observation of mapping sessions reveals not only clearly identifiable sensemaking instances, but highlights the "micro-moments" [6] where practitioners and participants make movements to bring sessions back on track after a disturbance or breach. Using a grounded theory approach [12], we are developing categories for the kinds of

sensemaking instances as well as practitioner moves that occur at such moments.

In the following section we present two short excerpts from broader case studies that illustrate the above. We'll then discuss how constructs from narrative theory and improvisation can help frame the excerpts.

**CASE STUDY EXCERPTS**

In this section we present two case study excerpts. Each outlines a moment in a live knowledge mapping session when something goes wrong, resulting in sensemaking and improvised actions to bring the session back on track.

**Example A**

The first example is taken from a workshop setting. Teams of three to four people were given the task of devising a knowledge mapping exercise that they would then facilitate with a large group of participants. In this example, we look at a sensemaking instance during one of the teams' large group sessions.

The instance occurred for about 2.5 minutes of a 24 minute session, starting at 13:36 and lasting until 16:58. The facilitating team had constructed a knowledge map with some seed questions that they asked participants to provide answers to (which they in turn added to the knowledge map displayed to all on a large screen in front of the room). One member of the team acted as the mapper. The session had proceeded more or less as expected until at 13:36 one participant (P1) began to challenge some of the contributions to the overall discussion, questioning why some participants kept asking if others' contributions counted as 'critical thinking' or 'visual thinking'.

The challenge did not fit into the planned flow of events, and the mapper, who up to that point had been able to capture participant contributions into the map quite fluidly, lost her way. She began trying to map P1's challenge at 13:49. At 14:42 she was in the midst of doing this when another participant (P2) made a new verbal contribution that did not reference the challenge. A third participant, P3,

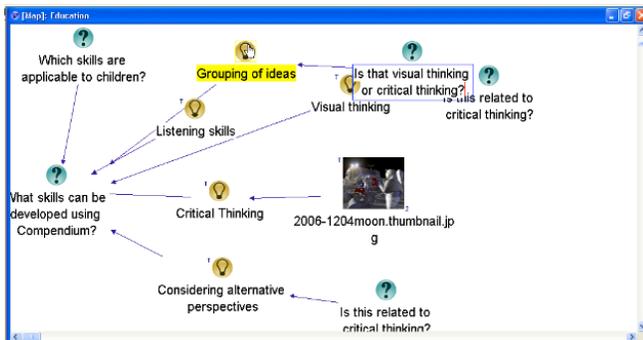


Figure 1: Map at 13:36

asked if P2's comment counted as 'critical thinking' or 'visual thinking', prompting a further challenge from P1.

The mapper was able to capture P2's 14:42 contribution on the fly, but couldn't map either P3's question or P1's new challenge. The interchange is shown here:

Time mm:ss	Dialogue/action
14:42	(P2) "I think another skill that can be developed ... is the ability to see bigger questions"
14:51	(P3) "Is that not also part of critical thinking?"
14:53	(P2) ""Uh it may or may not be but I ... that's my opinion."
15:03	(P1) "... why, why is it important... we seem to be getting caught up into but isn't that critical thinking, isn't that critical thinking. Why is that important? I mean, why is it important that we relate all these things to critical thinking."

In the course of this, the mapper got so far behind in mapping P1's challenge that she became stymied. This can be characterized as the sensemaking instance.

There are really two overlapping dilemmas. Firstly the participants' issue about how to frame the conversation itself, and secondly the mapper's attempt to regain her momentum and resume making coherent additions to the map. In this case, after some further back and forth among the participants, a fourth participant (P4) contributes a possible solution:

15:33	(P4) "OK... so I would now interrupt, as a facilitator I would interrupt, because I see, um, [the mapper], struggling with keeping up... OK so I would say 'hold that thought', let her just finish this for a moment... and then repeat your question so we can capture it."
15:53	(Mapper) "Um... yeah so I did, I wasn't able to capture the stuff that went into the 'What is critical thinking' and that's where I'm behind, I'm trying to copy."

After some negotiation about how much time was left in the session, the mapper asked the room for help in deciding what should be put onto the map. A fifth participant (P5) provided a helpful summary and suggestion for how to represent the discussion:

16:09	(Mapper) "OK. So what's the current thing I'm trying to capture"
16:11	(P5) "But [P2] said ... she thought one of the issues was the ability to see bigger questions, was something..."
16:18	(Mapper) "Right, so how would I do that..."
16:20	(P5) "...and then somebody said... isn't this just part of critical thinking so if I was mapping that I'd just put a minus there... and say isn't this just, you know, this is part of, should be part of critical thinking and then I'd put another question mark off that and say why is this important"

From that point until the end of the episode at 16:58, the mapper executed a rapid series of moves on the map, which are summarized here:

16:26	Moved cursor all the way to right side of the screen very briefly, then back to hover over 'Considering alternative perspectives' then 'Ability to see bigger questions' then down to bottom of window in response to P5's comments
16:35	Moved the new cloned node to under 'Ability to see bigger questions'
16:41	Linked cloned node to 'Ability to see bigger questions'
16:42	Highlighted the clone
16:45	Keyboard-created new Idea node linked to the Question, gave it the label "Why is this important?"
16:52	Moved node down and to the right slightly
16:54	Moved cursor out of the way over to the right
16:55	Moved 'Is this related to critical thinking' down and to the right slightly (for appearance)

This enabled her to bring the map up to the point where it corresponded to the summary provided by participant P5 (see Figure 2), and to announce at 16:58, "I'm caught up."

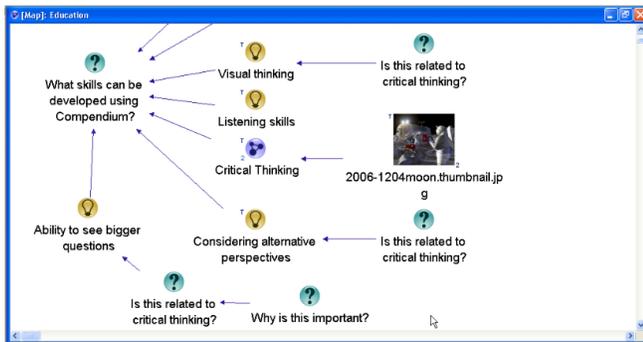


Figure 2: Map at 16:55

### Example B

The second example is taken from a NASA experiment in scientific collaboration as part of the Mobile Agents project [3]. A team of scientists spent two weeks at the Mars Desert Research Station in Utah. Each day they simulated portions of a Mars mission. They would plan and carry out an Extra Vehicular Activity (EVA) to gather science data, and then upload their plans, data, and analyses (assembled into a Compendium database) via satellite. Following a time delay, members of a Remote Science Team (RST) would download the Compendium database then gather in virtual meetings to analyze the data and form recommendations for the next day's plan. In both settings, a team member acted as the Compendium practitioner, creating maps of the discussion and analysis during the meetings.

The excerpt described here came from an RST mapping session that lasted 135 minutes. The episode happened

about an hour into the session and lasted three minutes. Participants met over a phone teleconference held simultaneously with a web conferencing tool so all could view the Compendium practitioner's computer display. All four were in different physical locations, in California, Arizona, New York, and the United Kingdom.

In the course of the planned analysis of the previous day's science data maps sent from the Hab crew, the RST discovered missing information, geographical "waypoints" data, that was needed to make sense of the maps they were analyzing. Its absence impeded their further progress.

Figure 3 summarizes key moments in the episode. It shows the trajectory from sensemaking trigger through improvised investigation, consideration of alternatives, map construction and refinement, culminating in direct verbal engagement between participants and practitioner (called "PRAC" here) and further refinement.

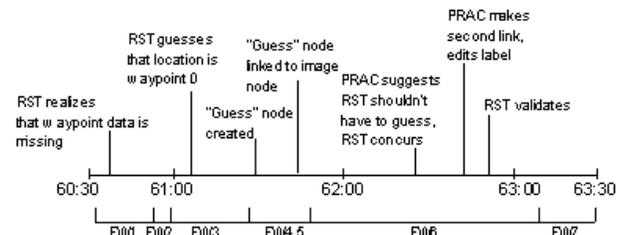


Figure 3: Timeline of Example B excerpt

The practitioner's responses combined specifically hypertextual actions, such as navigating through the views in the Compendium database looking for helpful clues and creating new hypertext content (nodes and links), with facilitative behaviors, such as listening closely to the participants conversation (even while engaged with his own hypertextual actions), making helpful suggestions, paraphrasing participant statements, and gaining validation from the participants for how he had represented their thinking on the shared display.

In the specific excerpt below, PRAC had been listening to the RST participants try to figure out what location the photo they were looking at could be. While listening, he created a node with the label "RST guessing..." as a placeholder.

At 61:50 he attempts to interject: "There shouldn't..." but the participants are still engaged in their conversation and don't hear him. PRAC decides to wait until there's an opening in the conversation. At 62:27 PRAC gets his thought out, saying "The RST shouldn't have to be guessing where this is taking ... should be quite..."

By doing this, he intervenes in the flow of the RST's discussion and returns it to the particular process point he is concerned with, mainly the way the science data had been imported into Compendium. The participants pick up this thread in their discussion (62:30-62:49): "No, you know what, yeah, they should definitely, I mean, since we're

using waypoints for this? There should be somewhere that says what the waypoint...” “Waypoints... instead of just giving us GPS coords because it means basically” “I mean they put it in the name of the picture? I don't know if that's such a good...” “I don't know.”

In response to these statements, PRAC refines the “RST guessing...” node he had made earlier with the point about GPS coordinates that the participants just made. He first (at 62:49) creates a second link of that node to the map node containing the GPS coordinate information, indicating that the node is also commenting on the GPS coordinates, then clicks into the label of the “RST guessing...” node (at 62:50) and adds “GPS coords not so helpful”, a paraphrase of RST1's comment above, to the end of the label (see Figure 4). At 62:52 RST1, who's been watching the moves, makes a direct response to PRAC's paraphrase as entered into the node (in italics below): “Y'know it should have, the, y'know, it should say Waypoint zero.... At this point it isn't helpful because we have to go back. So, um, ... what we put in here is “RST guessing that this is at Waypoint 0. GPS Coords not so helpful,” which served as validation of the text PRAC had put into the node.

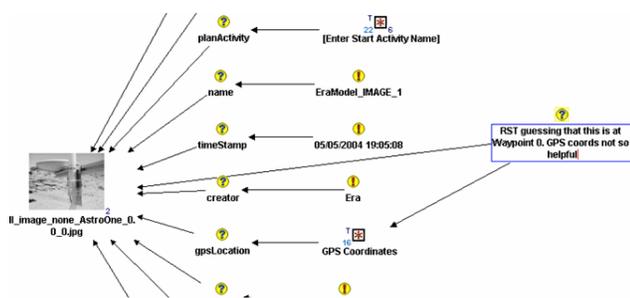


Figure 4: Portion of map at 63:10

## NARRATIVE AND IMPROVISATION

We have found constructs from narrative theory and improvisation to be helpful in analyzing practitioner sensemaking in such sessions. Although the brief descriptions above barely scratch the surface of the richness of the events they are taken from, they hopefully provide enough context for the following remarks.

### Narrative

The narrative dimension of practitioner sensemaking concerns the connecting together of diverse moments and statements over time. Practitioner actions which have a narrative dimension – that serve to connect elements of the story being built in the knowledge maps for later “telling” and “reading” by others -- contribute to the shaping of both the group’s efforts and the knowledge maps that are the focus or product of their work. Narrative is both a basic psychological mechanism independent of any particular embodiment, and an aesthetic form that can be represented in verbal, written, performed, or other forms. It functions as a key human strategy for exploring and overcoming unexpected turns of events. This is particularly so when

there is a break or disruption from an expected course of events. “The function of the story is to find an intentional state that mitigates or at least makes comprehensible a deviation from a canonical cultural pattern.” [2] Narrative is also an intentional form – narratives are created, with varying degrees of skill, in various forms, to serve various purposes. Narrative analysis provides a frame for understanding practitioner efforts to maintain the coherence and integrity of their knowledge maps even in the face of interruptions and potential derailments of their sessions.

### Improvisation

While some aspects of collaborative knowledge mapping practice follow pre-determined patterns and draw on techniques and methods planned in advance, skilled practitioners often find themselves improvising. Sawyer [10] discerns three levels at which to understand improvisation: individual, group (improvised interactions within a bounded, particular situation), and cultural. The cultural level supplies the elements of a practitioner’s repertoire, the bag of pre-existing techniques and concepts that collectively determine the “scope of choice” [11] that the practitioner draws from in the heat of an encounter. Practitioners of exceptional skill often possess repertoires of great “range and variety” [11] which they are capable of invoking in innovative, expressive, and subtle ways. This kind of characterization is particularly apt when a practitioner is confronted with a situation of confusion or uncertainty, where they can no longer continue on with a single pre-existing method or technique (though they may return to it later) and must make a high number of rapid decisions about what actions to take, ways to inflect those actions, or risk losing the coherence of the session, thus jeopardizing its goals. Skilled practitioners are able to navigate judiciously between moments when they can rely on pre-existing structure and scripted actions, and moments when fresh responses and combinations are called for.

## DISCUSSION

In this section we provide a brief discussion of how the sensemaking instances in both excerpts A and B, can be usefully framed using some of the narrative and improvisation concepts just mentioned.

In both excerpts, we see practitioners confronted with a breach in the expected chain of events, resulting in sensemaking instances. In excerpt A, this was caused by an escalating series of challenges and interruptions among the participants that caused the mapper to lose her place. In excerpt B, the disruption was caused by the lack of crucial data necessary to make sense of the map the group was analyzing.

In each case, there is a pre-existing set of narratives that frame the events, supplying expected causality, reasons for people to be at the event, expected roles, and assumed meanings. In excerpt A, some of the relevant narrative aspects include the ostensible purpose of the workshop, the

personal reasons each participant had for attending (e.g., what they hoped to gain from it), the expected trajectory of the facilitated session itself, and the mapper's own expectation that she would be able to capture and represent the discussion as it unfolded. When the session started to unravel, this constituted a breach for which there was no ready-made, unproblematic response. In excerpt B, the episode occurred against the narrative backdrop of the Mobile Agents project, the institutional affiliations of each of the participants, the ways that previous sessions had unfolded in the project, and the assumptions that the RST and PRAC had about what data would be present in the maps, each with their own expected trajectory and expectations. When they realized that the waypoints data was missing, this was experienced as an unwelcome surprise, a confounding of the expectations grounded in the various narrative frames each person brought to the event.

In both excerpts, we see improvised actions that draw on practitioner (as well as participant) repertoires. In excerpt A, up to the point of the breach, the mapper had followed a straightforward, pre-planned "dialogue mapping" [5] approach in her work on the knowledge map. When things went wrong, this had to be (temporarily) abandoned. With the help of several of the participants, the mapper was able to recast the situation, which helped her launch a rapid series of actions on the map to bring it back to a point where forward progress, and the dialogue mapping technique, could resume. In excerpt B, PRAC came up with an improvised approach to representing the confounding lack of waypoint data and the RST's response to it, in such a way that condensed the team's "guess" as well as their interpretation of what it meant to the overall process for the project in a single node. He used link arrows to show how the point related both to the image node that should have contained the missing data, as well as the "GPS Coordinates" map node that the participants were commenting on.

## CONCLUSION

In this paper we have briefly sketched some ways in which constructs from narrative and improvisation theory can add context and nuance to analysis of sensemaking behaviors and actions. We are particularly interested in the role that "moves" on a shared representation, such as the hypermedia knowledge maps examined here, can play in the context of collaborative sensemaking. It's our belief that what might be called "artifactual sensemaking" can enhance other forms of sensemaking research. For example, showing how the shaping of representational artifacts is affected by "interrupts" [8] can shed light on practitioner sensemaking

in other fields. Similarly, examining how practitioners assist groups in making meaning with and through such artifacts can extend work on reflective practice, particularly "the artistic, intuitive processes which some practitioners bring to situations of uncertainty, instability, uniqueness, and value conflict" [11] – in other words, sensemaking.

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