KNOWLEDGE MEDIA

KMi

INSTITUTE

Aesthetic and Ethical Implications of Participatory Hypermedia Practice

First Year Report

Al Selvin

The Open University

Acknowledgements

Abstract

This report summarizes my first year of doctoral study at KMi and presents a proposal for the remaining work leading up to the dissertation. My research concerns expert human performance in helping people construct representations of difficult problems – a practice I refer to as participatory hypermedia construction (PHC). I am particularly interested in what happens when practitioners encounter sensemaking moments, when they must improvise in order to move forward, and in the aesthetics and ethics of their actions at such moments. Little is known about the practice of constructing hypermedia representations despite more than twenty years of existence of tools and surrounding research. What are the components of expertise in this domain? What are people who are able to work fluidly with the medium, especially in highly dynamic and pressured situations, actually able to do? In what ways does this expertise compare to that of analogous professions and practices? My research aims to provide answers to these questions. In the past twenty months, I have explored a variety of approaches to begin to characterize and categorize PHC expertise, including a literature review, experiments in collaborative hypermedia authoring, and a grounded theory and critical incident analysis of in situ expert practice. I have constructed a preliminary taxonomy of practitioner "moves" and performed a deep analysis of the aesthetic, ethical, expertise, narrative, and other dimensions of a series of critical incidents. These activities have given me a good understanding of the issues, timeframes, and risks associated with performing this kind of analysis, which provides the basis for a proposal to create a survey and critical review of the contributions and gaps in existing research literature; provide a language for characterizing expert practice in participatory hypermedia construction, including a taxonomy of concepts; validate the language and taxonomy against deep observation of in situ practice, and extend the work of other researchers looking at analogous practices.

1 Introduction

In the 1990s I worked with many different groups in diverse settings as a practitioner of participatory hypermedia construction[1] (PHC). I often experienced close engagement with the tools, representations, and participants, working fluently and fluidly with complex hypermedia artifacts that took on great significance for myself and the people engaged with them. Yet, when I examined the research literature in hypermedia, computer-supported cooperative work (CSCW), human-computer interaction (HCI), group support systems (GSS), and related fields, I found little or no work that addressed or explained such experiences, or shed light on what seemed to me some of their central phenomena: the aesthetic, improvisatory, ethical, narrative, and sensemaking dimensions of the encounter of skilled practitioner, hypermedia artifact, participants, and methods. What work touched on these subjects did so only in passing. Most work in any related fields avoided the subject of practitioner experience or expertise.

Although she was describing a very different phenomenon, Adrienne Rich's oft-quoted statement about different kinds of knowledge serves well to describe what I found in the research literature about this sort of practice:

> When someone with the authority of a teacher, say, describes the world and you are not in it, there is a moment of psychic disequilibrium, as if you looked into a mirror and saw nothing…Yet you know you exist and others like you, that this is a game with mirrors. It takes some strength of soul – not just individual strength, but collective understanding – to resist this void, this non-being, into which you are thrust and to stand up demanding to be seen and heard ... to make yourself visible, to claim that your experience is just as real and normative as any other.
> (*Invisible in Academe*)

When I began my doctoral studies in 2003, I approached the literature with fresh eyes, only to encounter a similar lack. The same experience occurred at research conferences. Broaching my topic would result in polite smiles and lack of interest, far from being the subject of central concern that I imagined I'd find. The research literatures that seemed closest to the topic, such as GSS facilitation, stressed aspects that stayed, for the most part, quite far from the issues and considerations closest to my own experience. A few of my PHC practitioner colleagues, though they did not use all of the same terms to describe their experiences, did report some profound results and recognized the levels of skill and mastery involved in the practitioner's craft. I felt that these experiences were both genuine and of worthy of research interest; more to the point, understanding these

---

[1] I do not use the (possibly more familiar) term "collaborative hypermedia" for the hypermedia practice under examination, although it is certainly highly collaborative. That term is conventionally used to describe web-based hypermedia tools of various kinds that allow for asynchronous input from multiple users. Instead, "participatory hypermedia construction" emphasizes both the participatory design (Greenbaum & Kyng, 1991) nature of the hypermedia artifacts being built, and the "construction" aspect of people working together to create the representations.

dimensions of expert PHC practice might lead to breakthroughs in tool support, method development, and practitioner training (and thus enhance the effectiveness of the practice).

My effort in this research will be to recast the study of practices like PHC from the "technocratic" (Aakhus, 2001) mold of most existing research to a more generative framework characterized by issues of aesthetic competence, narrative, improvisation, sensemaking, and ethics. These characteristics are freely imparted to expert practice in other, analogous fields, and in some cases are of central research concern. My belief is that PHC holds great potential to help address many collaborative and societal problems, and that the main thing holding back the realization of this potential is the current dearth of skilled practitioners. While putting together the analysis that follows, I have often reflected that in a future world where skilled PHC practice is commonplace, the kinds of issues I am attempting to address would be equally as common, as they already are in fields like teaching, mediation, and counseling. Thus a fundamental contribution I believe this work can make is to heed Schön's (1983) call to surface and characterize the epistemology of PHC practice, to pave the way for the research that will need to exist when such practice is more widespread.

2 Literature review

This literature review provides an overview of the major themes that have guided my initial research over the probationary period (October 2003-June 2005, part-time) of doctoral work. My main purpose over this period has been to develop initial conceptions of ways to characterize expert practice in helping groups construct participatory hypermedia representations.

Hypertexts don't spring to life fully formed. Their creation and evolution are the product of human engagement, skill, and hard work. Yet, to paraphrase Mark Bernstein's call for "native hypertexts," (Conklin et al, 2001) one may well ask, "where are the accounts of hypermedia practice?" Where are the examinations of what it actually takes to foster engagement with hypermedia artifacts, or of the situated work of skilled hypermedia practitioners endeavoring to use the tools and representations to further the aims of a group of people engaged in a collective effort? What kinds of expertise and artistry does this require? Are there particular ethical as well as aesthetic considerations that inform, or should guide, such practices?

I have been working with participatory hypermedia representations since the early 1990s, in a wide variety of industry and academic contexts (Selvin, 1999; Selvin, 2003, Selvin & Buckingham Shum, 2002, Buckingham Shum & Selvin, 2000). In that time I have grown increasingly aware that doing such work, particularly when acting as the facilitator for a collaborative effort, often under conditions of pressure and constraint, requires special skills and draws on particular capabilities. Understanding these capabilities, as well as developing effective support tools and methods for them, seems a fruitful area for inquiry. I have also found that questions such as those in the previous paragraph are rarely raised in the hypermedia, human-computer interaction, or computer-supported collaborative work literature.

2.1.1 Key concepts

The concept map in Figure 1 summarizes some of the key concepts I will cover in this chapter.
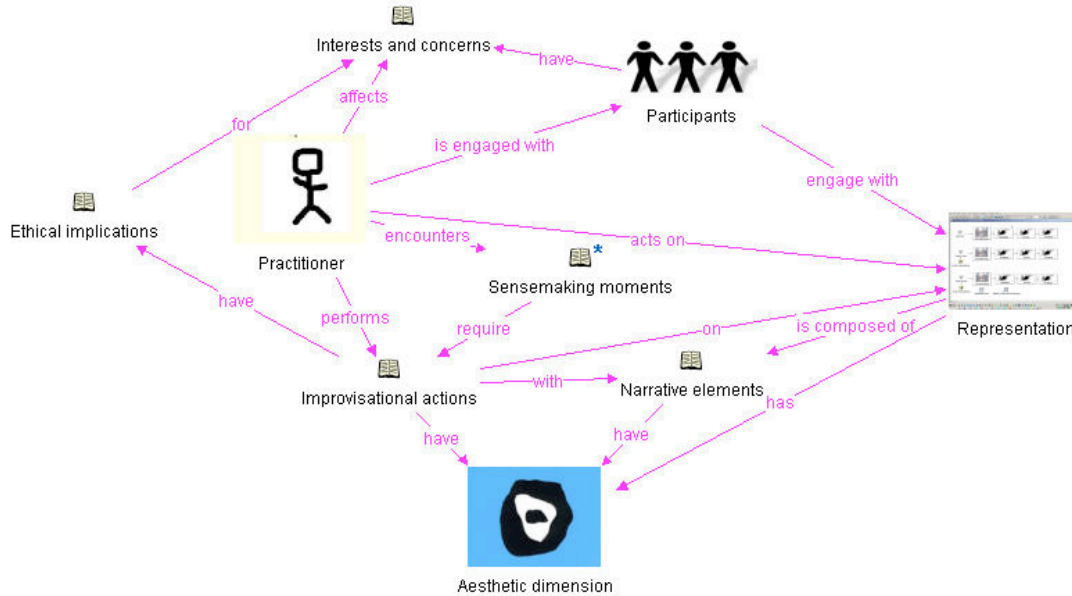
Figure 1: Key concepts

In Figure 1, a PHC practitioner is engaged with participants who are themselves engaged in some sort of collaborative or problem-solving activity. The practitioner acts on a hypermedia representation, which is itself composed of narrative elements – ideas and relationships arranged in meaningful ways over time. The participants, who bring to the event their interests and concerns (along with their relationships to one another, their communicative capacities and their constraints) also engage with the representation, if and when they are drawn to it. In the course of the work, practitioners encounter sensemaking moments when forward progress is disrupted by some unexpected or problematic event. This requires the practitioner to perform improvisational actions with the narrative elements of the representation. These actions, like the representation itself, have an aesthetic dimension – that is, they are made with intention and meaningful form. Because practitioner actions affect the participants' interests and concerns, the actions have ethical implications.

This research will draw connections between aesthetic aspects of the work of a PHC practitioner – particularly those concerned with improvisation and narrative – and ethical aspects, especially those concerned with participation and engagement. In what ways do these aspects of the work relate to and support each other? What can be gained from an understanding of the relationships of improvisation, narrative, participation, and engagement? Are there lessons to be learned from the intersection of these aspects in a specific (and still esoteric) practice that are generalisable to other practices, or to other issues in the literature about and consideration of the technologies involved in the practices?

2.1.2   Organization of this review

This literature review will explicate the key dimensions shown in Figure 1. Figure 2 below shows the overall plan of the review.

Conceptual framework

Aesthetics	Improvisation	Sensemaking	Narrative	Ethics

Specific practices

Hypermedia	GSS Facilitation	Mediation	Other practices

Research Methods	**Intended Contributions**
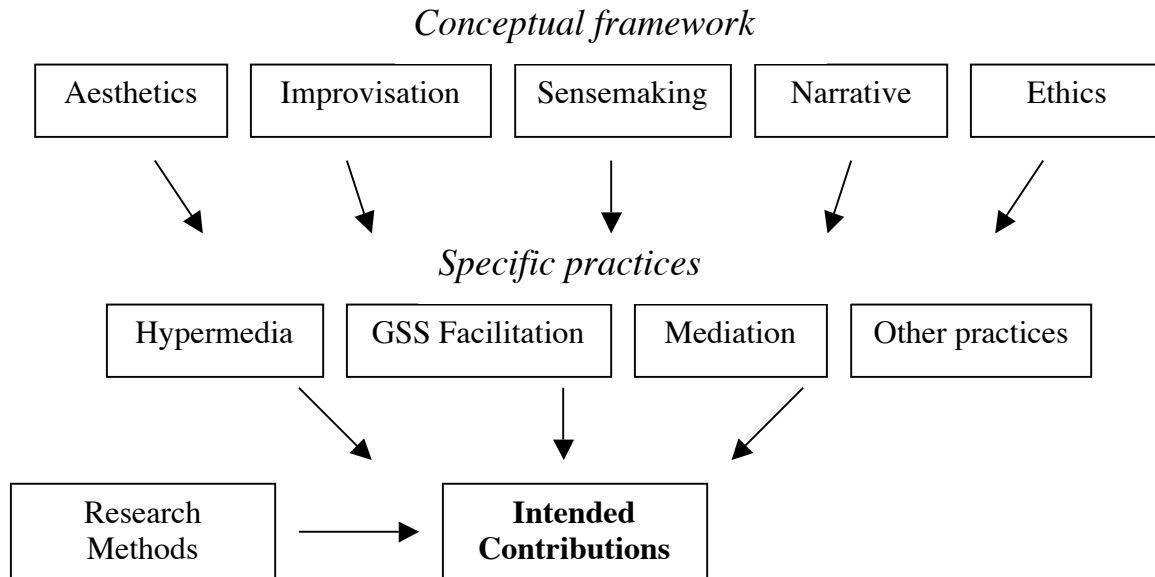
Figure 2: Overview of related literature

The bulk of this chapter will concern the top row of the diagram above, describing the basic principles that underlie a picture of PHC practice. These principles (outlined below) will inform the analysis of how practitioner issues are covered in the research literatures on specific practices related to PHC. Finally, I will discuss research methods appropriate to the study of these phenomena.

The *aesthetic* dimension is concerned with the shaping and crafting of representational artifacts, their visual form and narrative properties in response to both immediate and context-specific imperatives (things that must be done to help achieve participant and project goals), as well as in response to implicit and explicit concepts of right form.

The *ethical* dimension is concerned with the responsibilities of the practitioner to the other people involved in the projects, and to their various individual and collective needs, interests, goals, and sensibilities. In some situations, these responsibilities can be weighty – for example, in situations of conflict, dispute, enmity, where every action and statement on the part of participants or practitioner holds the possibility of worsening the situation. In less fraught settings, consequences of action or inaction may be less severe, but there are nonetheless consequences that can be discerned. Each practitioner action or inaction has effects of various types on the concerns and communicative quality. of the direct participants as well as other stakeholders. Of particular concern to this research are practitioner actions that affect the *engagement* of participants with each other, with the subject matter of their work, and with the nature and shaping of the hypermedia artifact.

Of further concern are the actions and their consequences for what takes place at moments where the forward progress of the event is blocked because of some unforeseen, uncontrolled, or otherwise problematic obstacle. These moments, referred to as *sensemaking moments,* foreground the *improvisational* aspects of practitioner actions. At

such moments, the need for a creative and skilled response, visible through the practitioner's use of tools and verbal interactions, stand in especially sharp relief, since programmed or prescribed responses and rote actions are rarely sufficient in such situations.

An aesthetic dimension of particular interest is that which concerns *narrative* – the connecting together of diverse moments and statements over time. I will look at how practitioner actions serve to connect and create elements of the story or stories at work in their engagement with participants. Of particular interest in those moments are the actions which have a narrative dimension – that serve to connect elements of the story being built in the hypermedia representation for later "telling" and "reading" by others – contribute to the narrative shaping of the event itself and the hypermedia representation that is the primary focus of their actions. It is a primary contribution of this research to foreground the improvisational shaping of narrative that can occur in skilled participatory hypermedia construction.

Although they are only lightly covered in this review, I will also mention how the constructs above are discussed in the hypermedia, group support systems, and CSCW literature and discussion of analogous practices. Such references are also woven through the other sections of the literature review.

I'll conclude by analyzing how best to study the dimensions above, through consideration of a number of research methods. In the Proposal section of this report, I'll outline the directions my literature review will take over the next two years of research.

The following five sections of this review define my conceptual framework in more depth, focusing on practitioner aesthetics, improvisation, narrative, sensemaking, and ethics.

2.2 *Aesthetics*

In *Reflection in Action*, Donald Schön articulated a challenge to researchers looking for ways to pull understanding of the professions away from rationalist conceptions of expert practice. Such conceptions characterize professionalism as the ability to choose and apply techniques learned in school to prescribed types of situations. Schön insisted that there is an artistry to professional practice that, although difficult to describe, nonetheless informs and shapes what expert practitioners actually do, especially in situations that do not conform to a priori parameters – those that call for "problem setting" in addition to "problem solving." The following quotation, in some sense, serves as the spindle around which my current research turns:

> Let us search … for an epistemology of practice implicit in the artistic, intuitive processes which some practitioners do bring to situations of uncertainty, instability, uniqueness, and value conflict. (1983:49)

As Schön's statement implies, by including the aesthetic in an analysis of practice, we may uncover aspects of practice that would be missed using more conventional or "techno-rational" approaches.

To help in this search, I'll review some aspects of the artistic, or aesthetic that inform the conception of practice used in this research. I will not try to cover all aspects of aesthetics, but rather touch on those that help focus on the idea of the aesthetic dimensions of the practice of participatory hypermedia construction.

2.2.1 Conceptions of aesthetics

Aesthetics has multiple aspects – there is no all-encompassing meaning for the term. As Cohen outlines, the object of aesthetic studies and theory has "three clusters of concepts – pertaining to (1) the integration of the sensuous and the rational, (2) form and attention to formal qualities, and (3) transformations in the qualities of attention related to non-utilitarian response" which "are related in complex ways" (1997: 177).

Aesthetics has to do with what human beings, in the moments when they are acting as artists (Arnheim, 1967), are actually doing. What distinguishes artistic actions from other sorts? What are the uniquely aesthetic characteristics of such actions, especially in the work of a PHC practitioner?

I am not considering aesthetics as a concept or phenomenon standing on its own, and I will not be applying a purely aesthetic analysis to PHC representations themselves. Rather, I am focusing on *practitioner aesthetics* – the aesthetic qualities exhibited by practitioners in the course of performing their practices – the aesthetics in action, so to speak.

Foremost among these are the idea of giving form to experience (Dewey, 1934) and of seeing relationships among disparate parts to form a whole. The emphasis on experience has to do with *felt* or *lived* experience, as well as the dimension of *creating* experiences.

In this definition, practitioner aesthetics has to do with the ability to pull together aspects of experience into a new whole that itself provides a (shaped) experience. For practitioners working with groups, the boundaries of the world of experience are closely aligned with the situation in which they are operating – the people, goals, interests, and constraints of the project or team they are working with. Even within this bounded world, the dimensions and particulars of experience can be vast and diverse, so the problematic – and hence the artfulness – of pulling them together into an "integrated structure of the whole" (Arnheim, 1967).

2.2.2 Aesthetics and the practitioner/participant relationship

Using the lens of aesthetics can offer a unique perspective on the relationship of a PHC practitioner to the participants in a situation. The school of feminist aesthetics moves the focus from artifacts created by master artists to an aesthetic that "emphasizes process, elevates collective and participatory expressive forms, and integrates ethical and political concerns" (Cohen, 1997: 171). Thus, according to this view, understanding the artistic dimension of a PHC practitioner's work will pay particular attention to how the encounter between participants, artifact, and practitioner unfolds, the extent to which representation-building engages participants, and the ways in which participants are affected by the proceedings as a focus for analysis (both the immediate proceedings, and the relationship of participants to their larger context). In the view of a 'matriarchal' approach to art

> all participants are simultaneously authors and spectators. Because of this, analysis of the relationships among the author, text and reader (or artist, object or performance, and audience), so prevalent in Western understandings of the aesthetic, are irrelevant. The focus of this theory is on the process of the creating, (not on the object created). The proper attitude for those involved is one of "total commitment." (Cohen, 1997: 221)

Such a stance explicitly incorporates the PHC practitioner's moment-by-moment handling of the representation and the degrees and levels of engagement of participants with each other, the representation, and the practitioner into the realm of the aesthetic (indeed, it argues that they are never separate). It also incorporates the idea that the practitioner is a personal actor in the situation, or more precisely that their representational actions are ethical actions, or at least, normatively speaking, should be thought of that way.

This sets up something of an imperative for aesthetic practices: "good" practitioners will pay attention to these aspects in the performance of their practice. Participant concerns, engagement, and acting as practitioners or makers themselves are always to be subjects of concern, and an attitude of commitment to these aspects of practice is expected.

2.2.3 Practitioner aesthetics

Using such a conception shifts the focus for understanding expert practice from rationalized methods, to the ways in which practitioners faced with an anomalous or unique situation make instantaneous, improvised choices and new combinations from

their repertoire (Schön, 1983) of possible actions and techniques in the service of coming up with the most appropriate and helpful responses and actions. For Schön these are unquestionably artistic performances:

> He responds to the complexity, which confuses the student, in what seems like a simple, spontaneous way. His artistry is evident in his selective management of large amounts of information, his ability to spin out long lines of invention and inference, and his capacity to hold several ways of looking at things at once without disrupting the flow of inquiry. (Schön, 1983: 130)

It's important to disassociate the realm of the "aesthetic" from any sense of elite or fine art connections. Rather, aesthetics should be viewed as an inherent aspect of a particular family of human activities. Aesthetics can be understood as a particular way of "integrating the rational and the sensuous" (Cohen, 1997: 181) by organizing sensory input into symbols and patterns, lending coherence and meaning to these arrangements. The skill of such aesthetic practice, what differentiates a novice from a master, is in the depth and complexity that practitioners give to their representations. Such representations are not the same as purely rational ones:

> What power such symbols may lack in precision, they may offer in originality, and in the depth of feeling and the richness of resonance with which they communicate. (Dewey, 1934)

The act of taking events from the stream of consciousness and organizing them into some new form is inherently aesthetic:

> The very act of composing or defining "an experience" out of the ongoing stream of experience — i.e., giving structure and closure to an interaction or series of events — in itself confers an aesthetic quality onto events.
> (Dewey, 1934: 38)

2.2.4   Definitions of aesthetics

The term "aesthetics" has until recently been relatively foreign to studies of human-computer interaction (Bertelsen & Pold, 2002), except with reference to graphic design. Traditionally, the focus of HCI and CSCW tends towards the functional – how best to support particular kinds of work, to better fit the tool(s) to the purpose(s), and to understand the purposes and tools themselves better, in all their social and cognitive dimensions. More recently, there has been renewed interest in the aesthetic and emotional dimensions to HCI (e.g. Fishwick et al, 2005). This may in part be due to the embedding of computers in consumer 'lifestyle' products which users invest with the kinds of significances associated with other 'designer' artifacts (consider for instance the Apple iPod), but more broadly, it reflects a recognition that there is more to engaging user experiences with computers than functional power or ease of use. But the realm of aesthetics – the shaping and meaning of form – is missing from most accounts of computing practice. Since the aesthetic consideration of practitioner action is a core concept of my present research, I need to define what I mean by it.

In the common conception, aesthetics refers to ideas of beauty, particularly with regard to fine art. But it has a broader meaning in psychology, philosophy, and evolutionary theory. These conceptions explore the aesthetic aspects of more everyday actions and artifacts. Studies in evolutionary biobehavior have shown that art and art-making have been a prominent feature in every period of human history, stretching back not only for the two to three thousand years commonly thought of as the era of civilization, but in human settlements from more than 100,000 years ago (Dissanayake, 1988). Looking at art in this way positions aesthetics as a core human activity and concern, on a par with others such as religion and work, rather than the exclusive domain of highly trained artists operating in an "art world."

In this conception, the aesthetic dimension of human activity is that concerned with "making special," the act of giving an extra-ordinariness to everyday activities and artifacts, elevating their importance and significance through various means of making and heightening the sensual and emotional aspects of the artifacts (Dissanayake, 1988: 97-98). Art is thus an "evolutionary means to promote selectively valuable behavior." A phenomenological approach to the experience of making art (Brooks, 2000) moves the emphasis from the perceived aesthetic "value" of an artifact (measured according to rarefied art-world standards) to the lived experience of a person attempting to become aware enough of the character and subtleties of the subject they are trying to represent in an artistic medium, as well as how that representation can be accomplished through the tools and media at hand. Drath and Palus (1994) refer to this as "slowing down the looking." In such accounts, the emphasis moves away from the mystique of how to make fine art, to something more immediate and commonplace:

> I need to have a wide range of techniques that come to me uncalled. My skill with them must be somewhere outside my immediate awareness. I need to put skill behind me so that I can focus on what is transpiring in front of me. (Brooks, 2000)

In these conceptions, art is no less about skill, but skill in service of direct encounter of something of immediate importance and significance to the artist/practitioner and their community. Moreover it is skill that relies largely on intuition and a "feeling for phenomena and for action" (Schön, 1983: 241). As applied to practice of the type of concern to my research, which occurs in a professional context of providing "expert servicing" (Aakhus, 2001) to projects and participants, a phenomenological approach goes against conventional understanding of expert skill as an application of prescribed behaviors in set ways. This is a subject of central concern to Schön's account of professional practice:

> Surely they [professionals and educators] are not unaware of the artful ways in which some practitioners deal competently with the indeterminacies and value conflicts of practice. It seems, rather, that they are disturbed because they have no satisfactory way of describing or accounting for the artful competence which practitioners sometimes reveal in what they do…. Complexity, instability, and uncertainty are not removed or resolved by applying specialized knowledge to

well-defined tasks. If anything, the effective use of specialized knowledge depends on a prior restructuring of situations that are complex and uncertain. An artful practice of the unique case appears anomalous when professional competence is modeled in terms of application of established techniques to recurrent events. Problem setting has no place in a body of professional knowledge concerned exclusively with problem solving. (1983:19)

For Schön and others, such abilities move from the techno-rational domain to a more intuitive and subjective (in the sense of context-dependent) realm – what a skilled person can and does do in a particular encounter requiring unique responses. Practitioners engaged in such encounters may not be able to verbally describe what exactly they do in such moments, how they make the decisions and choose actions to take:

> When a practitioner displays artistry, his intuitive knowing is always richer in information than any description of it. Further, the internal strategy of representation, embodied in the practitioner's feel for artistic performance, is frequently incongruent with the strategies used to construct external descriptions of it. (1983: 276)

The lack of verbal articulation in no way detracts from the subtlety or efficacy of actions, though it places a heavier burden on those who would observe and characterize how the expertise plays out in practice.

2.2.5   Summary

Applying the considerations discussed in this section to what I know of PHC practice so far, it appears that aesthetics are an inherent aspect of the work of a PHC practitioner. They are especially evident in the seemingly intuitive and creative ways in which a PHC practitioner can respond to sudden or problematic situations. Attention to aesthetic aspects may reveal dimensions of practice that more techno-rational or behavioral lenses, such as those primarily employed in HCI analyses, may miss. Aesthetics can be understood as the selective apprehension and careful, expressive shaping of pieces out of the stream of experience in ways that blend the senses. Aesthetics is not a recent development among art-world elites and fine art but rather a core human activity of "making special" that extends back in time to every human culture in every era. A phenomenological understanding of aesthetics (acts of artistic creation) places attention on the orientation of a practitioner to their representation-making attitude, concerns, and attention in the moment of making. Being so concerned with intuitive, improvisatory, non-rational(izable) actions and constructs, practitioners themselves may not be able to describe the process behind the aesthetic choices they make. Finally, this conception of practitioner aesthetics has direct relationships to ethical concerns.

2.3   *Improvisation*

In both field experience and from my preliminary analyses, I've observed that a key dimension of PHC encounters is *improvisation*. While some aspects of PHC practice follow pre-determined patterns and draw on techniques and methods planned in advance, actual practice in real situations is often full of unexpected events, twists, and conditions. Skilled practitioners often find themselves improvising. This section explores the meaning of improvisation as a central characteristic of professional, expert, artistic practice.

As with aesthetics, improvisation is rarely a focus for research in the HCI, CSCW, hypermedia, and GSS fields. Even in fields like teaching or semiotics, despite their focus on the highly improvisational world of human speech, studies of improvisational aspects are relatively few and far between (Sawyer, 1996). Improvisation is difficult to control for or measure in laboratory or outcome-based studies of software tool use. In GSS research in particular, there has been a fairly relentless move to regularize the practices surrounding the technology analogous to similar moves to "script" teacher-student interactions (Sawyer, 2004) and to otherwise de-skill or de-emphasize the creative aspects of many sorts of professional practices (Schön, 1983). This is the 'elephant in the room' of much collaboration technology: the move to popularize (and sell) it largely depends on an assumption that corporations and other large institutions will only invest in such technologies of their adoption requires low skill levels, quick learning curves, and mass use. But many studies (e.g. Okamura et al, 1994; Levina, 2001) have shown that skilled human interpolation is necessary to make the technologies actually provide value. Taking a mechanistic approach, or pitching the technology at the lowest common denominator of skill, is a sure way to limit the flexibility and usefulness, and ultimately the value of, the tools.[2] Taking a "technocratic" approach to deployment of GSS can certainly spell out useful methods, but a situational approach recognizes that scripted methods in and of themselves often fail in the face of the unexpected and improvisation has to occur (Aakhus, 2001).

Yet improvisation is central to understanding what truly occurs in concrete, real-world software use situations. It isn't just a metaphor for what occurs in the encounter of participants, practitioners, context and tool use; rather, improvisation is core to a grounded theory of situated social action (Sawyer, 1997) for such encounters.

As with the focus on aesthetics, studying the role and nature of improvisation in PHC practice may reveal aspects that other sorts of focus on such work can't, or haven't. As far as I have been able to determine, such a study has never been done in the domain of participatory hypermedia. A better understanding of improvisation may provide new

---

[2] Long-time practitioners tell how the early success of GSS tools in the marketplace tailed off when the role of facilitator began to be played by lower-skilled workers, such as secretaries, even though the tools' vendors used this as a selling point (Chris Mcgoff, Touchstone Consulting, personal conversation).

sources of advantage and become a key resource for future practice, rather than just be seen as an inherent aspect or a matter of necessity (Schrage, 2000).

2.3.1   Understanding improvisation

As with other phenomena central to this study (aesthetics, narrative, sensemaking, and ethics), improvisation is an inherent capability of almost every person, manifesting itself, for example, in the amazing ability to sustain rapid-fire unplanned verbal conversations. Similarly, it is a property of professional practice that can be performed with a greater or lesser degree of expertise. Improvisation, as Schön and others note, is a part of many, if not most, professional encounters, but some professionals are more adept and fluid improvisers than others.

Sawyer (1999) discerns three levels at which to understand improvisation:

- *Individual*: improvisation on the part of particular actors)
- *Group*: improvised interactions within a bounded, particular situation)
- *Cultural*: "the pre-existing structures available to performers these often emerge over historical time, from broader cultural processes"

He critiques studying situated improvisation at only the individual level as "inadequate", since the other two levels will unavoidably bear on the situation. In this report, I will attempt to include all three, while leaning more towards the individual and group levels, in the interest of bounding the effort.

The cultural level supplies the elements of a practitioner's repertoire, the bag of pre-existing techniques and concepts (whether learned in school, or from work or other experiences) that collectively determine the "scope of choice" (Schön, 1983) that the practitioner draws from, combines, and invokes in the heat of an encounter. Practitioners of exceptional skill often possess repertoires of great "range and variety" (Schön, 1983) which they are capable of drawing on and combining in innovative, expressive, and subtle ways. A practitioner's repertoire contains a number of pre-existing *schemas*, or maps of the patterns encounters can take, which the practitioner "reads" to determine what elements to grab from his repertoire. Sawyer (1996) terms the elements in a practitioner's repertoire, such as the methods they know, the "readymades" they possess.[3] He characterizes the level of improvisation in a situation as a function of the "size" of the readymades involved and the "density of the decision points" as they both increase. The smaller the "bits" of pre-existing schemas or methods that provide a navigable map to a situation are, and the density (speed of occurrence as well as number) of what kinds of decisions actors in a situation must make, the more they must improvise, and the less they will simply be able to draw on and involve the "readymades" in their practice. This kind of characterization is particularly apt when a PHC practitioner is confronted with a

---

[3] The term stems from Marcel Duchamp's employment of commonplace items in his artwork, such as his 1917 "Fountain" (http://www.beatmuseum.org/duchamp/fountain.html), which was seen as radical in its time.

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 and ways to inflect those actions or risk losing the coherence of the session, thus jeopardizing its goals.

A key property of improvisation is its *emergent* character – situations or moments where the outcome "cannot be predicted in advance" and the actors don't know the meanings of their actions until others respond (Sawyer, 2004; Aakhus, 2003: 284). For situations like PHC practice, this can be further characterized as *collaborative* emergence, in the sense that "no single participant can control what emerges; the outcome is collectively determined by all participants" (Sawyer, 2004). In the realms of facilitation and mediation, where there is a practitioner helping a group of people (whose interests may be divergent) work together towards some common purpose, orienting practice towards the situation's emergent character is an important ethical stance. Mediators' intentions themselves should be emergent, based on the discovery of the actual (often shifting) nature of the situation (Aakhus, 2003). This orientation is lacking in much of the literature around software-assisted facilitation, such as that in GSS, which focuses more on the outcomes thought to be prescriptively associated with the use of particular techniques. Such work seems to assume that there are pre-existing techniques that can "match" the needs of any situation, or at least do not mention the role of improvisation in shaping practitioner actions, though much literature does address the need to skillfully choose and apply methods.

Maintaining an awareness of the emergent aspects of a situation, however, does not mean that all is left to chance. Sawyer (2004) emphasizes the concept of "disciplined improvisation," which juxtaposes improvisational aspects of practice (dialogue, sensemaking responses, spontaneous and creative acts) with "overall task and participation structures", such as "scripts, scaffolds, and activity formats." 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.

Studying the role of improvisation in skilled professional practice requires an emphasis on the character of practitioner actions in the face of difficult, unusual, or complex situations. Differentiating the expert from the novice, Schön argues, is the expert's ability to act effectively when being spontaneous without having to (or being able to) plan their actions in advance – acting with a rapidity and spontaneity that "confounds" the less skilled (Schön, 1983). The "artful competence" that expert practitioners can display inheres in just this ability to respond to a situation's complexity "in what seems like a simple, spontaneous way" (Schön, 1983), often drawing from elements only available in the immediate surroundings. For Nachmnanovitch (1990), this shows the expert improviser as a *bricoleur*, an "artist of limits," taking bits of the situation, combining them with their repertoire of readymades, and creating something of unique relevance to the needs of the situation. My research will focus on such moments as observed in PHC practice, when artful competence – the ability to respond rapidly, creatively, and

effectively to a unique and problematic situation – puts a practitioner's improvisational capabilities into the foreground.

It is not necessary that practitioners be aware they possess advanced skills or see themselves as an "artist" or "performer." They may not see themselves as doing anything other than taking "normal" actions in what amount to everyday circumstances.[4] Sawyer (1996) likens this to Sufi musicians, who consider themselves to be "evoking" rather than "expressing" the sophisticated improvised music they create. They believe themselves to be the vehicle rather than the agent of the artistry.

2.3.2   Master vs. novice

There are degrees or levels of improvisational mastery that can be observed in different practitioners. Furnham (2003) cites Frost & Yarrow's (1990) use of the term "disponsibilite" as a capacity of availability, openness, readiness, and acceptance; "the condition improvisers aspire to… having at one's fingertips the capacity to do or say what's appropriate." This distinguishes what could be called "intentional" improvisation – that entered into intentionally as a part of a known practice – from the inherent improvisation that all people do as part of everyday actions like verbal conversation. Expert improvisers are able to marshal the bits of routines, motifs, structures and frameworks they have learned (Sawyer, 2004) and assembled from experience and immersion in their medium. Beginners or apprentices will have neither this broad repertoire to choose from nor the experience to know what combinations might work in various situations (Sawyer, 1999). This only comes from having the ability to "devote the sustained attention to internalizing an improvisational tradition."

Schön (1983) illustrates this in his description of the mastery displayed by jazz drummers. They exhibit a "feel for the material", making "on the spot judgments" about how to read the schema at work and choose from their "repertoire of musical figures." The elements get "varied, combined, and recombined" to "give coherence to the performance." As the musicians around them make shifts in direction, each player "feels" the new direction, makes "new sense of it", and adjusts accordingly. To get to this point of expertise can take years of perfecting technique and building up a variety of elements to draw from, and the sensitivity to know which kinds of contributions will add to the whole, support the other players, and be fresh and authentic, not rote.

An effective improviser in a collaborative situation requires a certain stance towards the other participants to be effective. The "effects" (Sawyer, 2004) of improvisational actions are often not seen or appreciated at the moment they occur; rather, the meaning and impact of those actions become clear later, through "retrospective interpretation" engaged in through the collective subjectivities of the participants. Sawyer illustrates the kind of stance required for effective collaborative improvisation in his analysis of actors in improvisational theater troupes, which require a host of carefully followed processes to be successful. One such is the actors' avoidance of "playwriting":

---

[4] Indeed, I have experienced this in my own practice.

thinking more than one or two dialogue turns ahead – trying to predict the response to his or her proposal, and then formulating in advance his or her next dialogue turn. Given the uncertainty of improvisation, such prediction is impossible, and results in a distracted performer who is not "in the moment" and not fully listening to the other actors. (2004: 18)

Thus such improvisers combine aesthetic forms and practices – avoiding over-scripting and anticipation, not "denying" the action another takes in their turn[5] – with an understanding of the ethical effects of following or not following the particular aesthetic forms. If you don't follow them, you'll mess up the performance, the other players, and the audience's experience.

2.3.3   Improvisation as a component of facilitative expertise

Benjamin describes the "performance" artistry inherent in any skilled, committed negotiator or mediator, emphasizing both the required discipline and the ethical stance being "involved" with the situation and its participants:

> Against the backdrop of a carefully analyzed strategy, with practiced and disciplined technique and skill, they are able to improvise. The mediator – like the accomplished actor – is totally involved with the dramatic environment – intellectually, physically, and emotionally or intuitively. (2001)

Sawyer describes various elements of the required improvisational skills for mediators, especially in the context of enabling collaborative emergence. They must improvise in the (itself improvised) process of dialogue, managing "turn-taking, the timing and sequence of turns, participant roles and relationships, the degree of simultaneity of participation, and right of participants to speak" (2004).

In the absence of a structured or pre-scripted template for managing (at times fraught) conversational interactions, practitioners must themselves improvise the scope, nature, and tempo (frequency and depth) of their regulation of or intervening in the participants' discursive flux and flow. Beyond this regulatory role, they also need (if it is situationally appropriate) to "notice and comment on connections" between participants and with the content. This requires the ability to maintain "coherence with the current state of the interactional frame" (Sawyer, 1997) as well as looking for opportunities to contribute their own insights on items of relevance or points of connection in the discourse or surrounding context.

---

[5] Sawyer gives as an example that one actor can't say something like "get in the back" assuming that the other will know they meant a bus, then if the other says something like "OK but can you turn the closet light on" the first can't then say "There's no closet in a bus!")

2.3.4   Summary

Improvisation is not typically a research focus in computing research, although it is a pervasive activity in everyday life, including tool use. Unless psychologically hampered in some way, all humans improvise, and it can be studied at individual, group, and cultural levels. Improvisation can be understood as fresh combinations of pre-existing schemas, repertoires, or "readymades." Improvisation is emergent rather than static, and holding an orientation towards emergence is an important ethical stance for improvisational practitioners. Master improvisers can be differentiated from novices in the depth to which they've internalized the improvisational tradition of their particular discipline, and the skill and freshness with which they are able to draw from their broad repertoires. Improvisation requires particular ethics in settings where participant interests and concerns are at stake, such as those in mediation and facilitation contexts.

2.4   *Sensemaking moments*

A key concept discussed in the preceding section is that practitioners can encounter moments and situations of complexity and uncertainty, requiring improvisation, and that the quality and effectiveness of improvised actions in those moments is a key differentiator of the expertise of a given practitioner. Many writers have termed the cognitive process that occurs in such moments as *sensemaking*. I will use the term *sensemaking moments* to refer to those situations. Sensemaking provides a good description of what happens at the moment of encounter with the unexpected. I will describe the particular character of the form practitioner sensemaking takes at those moments, especially as it is expressed through, and manifested in, hypermedia moves, explorations of and changes to the hypermedia representation and interactions with participants about it. In what ways does the hypermedia representation and the practitioners' interactions with it contain both a source of obstacles and impasses, and a means of resolving or addressing them? Closely studying what practitioners do in sensemaking moments may "stimulate the communicative imagination of practitioners and refocus professional development" (Aakhus, 2001). What skilled practitioners do in sensemaking moments, not only with hypermedia but with software technology in general, is an understudied phenomenon and can be a potential source of advantage.

Dervin's (1983) model of individual sensemaking posits that a person is always attempting to reach a goal, or set of goals. This can be as simple as finding a book in a library, or as complex as a multilayered and contradictory set of objectives, many of which an individual may not even be consciously aware of. For example, the complicated feelings a new student may experience in their first week away at college, living among strangers for the first time. Goals themselves shift in priority and nature, in time and place. Some are explicit ("I need to register for the classes I want to take") where others are tacit (e.g. taking an array of interesting classes while leaving enough time to make friends). Individuals move toward these goals until they are stopped by an obstacle (e.g. reaching the registration hall but having no idea how to proceed). The obstacle impedes their progress and stymies their efforts to continue. In order to resume their progress, they need to design a movement around, through, over, or away from the obstacle. This can be as simple as asking someone for directions or help, or undertaking a more complicated set of actions that may have a trial-and-error character. Sensemaking actions can be understood as attempting to answer a set of questions: What's stopping me? What can I do about it? What can help me choose, and take, an action? Weick (1993) defines sensemaking as the process of constructing "moderately consensual definitions that cohere long enough for people to be able to infer some idea of what they have, what they want, why they can't get it, and why it may not be worth getting in the first place."

Although in some ways sensemaking can be thought of as a perpetual, ongoing process (Weick, 1995), it is also something placed in the spotlight by surprise, interruption, or "whenever an expectation is disconfirmed." "Someone notices something, in an ongoing flow of events, something in the form of a surprise, a discrepant set of clues, something that does not fit." The experiences and activities these encounters have also to do with

"issues of identity and reputation" – how we think of ourselves and how others think of us in our roles.

Schön (1983) characterizes such moments in professional practice as situations of "complexity, instability, and uncertainty," laden with "indeterminacies and value conflicts." Such moments are further characterized by a "density of decision points" (Sawyer, 1996). In professional practice, the moments where sensemaking comes to the fore can have the character of impasses (Aakhus, 2003) or what Aakhus terms "dilemmatic situations" (2001).

These moments are not of any inherent length. Schön refers to the time-scale of such moments as the "action-present":

> the zone of time in which action can still make a difference to the situation. The action-present may stretch over minutes, hours, days, or even weeks or months, depending on the pace of activity and the situational boundaries that are characteristic of the practice (1983: 62).

Schön's conception of reflection-in-action "hinges on the experience of surprise"; an expert professional is able to respond to this with an artful, sophisticated exploration of the "understanding which he surfaces, criticizes, restructures and embodies in further action" (1983: 50). The professional engages in a "conversation with the situation." Aakhus characterizes this as a "design" activity (2003). There is also an aesthetic dimension, which Cohen finds in Peirce's epistemological concept of "abduction":

> Abduction is a creative process, generating new insights, or explanations that reduce "manifold[s] to unity" (Peirce, 1960, cited in Davis, 1972, p. 47). Abduction functions in "ordinary" perception, as when "the mind struggles to get a grasp on a scene, and finally, as in a flash, the connection and harmony become apparent.... During the period of confusion, all of the data were present; all that was lacking was an hypothesis, an interpretation of the data" (Davis, 1972, p. 47). We can infer that, in Peirce's vocabulary, aesthetic engagement involves abductive, pattern-finding processes … levels of apprehension that are close to sensation and emotion, and prior to conceptualization. (1997: 186)

2.4.1   Summary

The actions of a skilled practitioner at sensemaking moments, moments of uncertainty and complexity, characterized by surprise and interruption and the confounding of expectations, differ from those of a novice of less skilled actor in the depth and quality of the reflection-in-action, aesthetic engagement, and rapidity of effective response. The moments can extend in physical time. Focusing on the improvisational actions of a PHC practitioner may illuminate both the nature of skilled practice in this medium and lay out directions and options for future research and professional development.

2.5   *Narrative*

It may seem strange to place narrative at the core of an understanding of real-time participatory hypermedia construction practice, but it is central to a full understanding of the role and its context. Narrative is both a basic human psychological mechanism independent of any particular embodiment, and an aesthetic form that can be represented in verbal, written, performed, or other forms. Narrative functions as a key human strategy for exploring and overcoming unexpected turns of events. As discussed in the previous section on sensemaking moments, narrative is a central means by which we are able to glue together bits of experience to construct a new understanding. Narrative is a key part of human development, a way that we learn to construct and communicate understanding of events and environments. Narrative is also an intentional form – practitioners create narratives, with varying degrees of skill, to serve various purposes. Among these are techniques such as narrative therapy, in which practitioners help their clients construct new life stories in order to come to fresh understanding of their agency, experiences, and possible new actions. Narrative is used as a mediation strategy in dispute and conflict resolution settings. Understanding the ways narrative is used in these contexts helps shed light on the ways PHC practitioners weave various narrative strands and employ intentional narrative techniques in their work, as well as providing a frame for understanding the practitioners' efforts to maintain the coherence and integrity of the hypertext representation, even in the face of interruptions and potential derailments of their sessions. Finally, narrative is central to hypermedia representations, providing associations between disparate elements in the service of various themes, adding the dimension of temporality. Narrative itself is uniquely hypertextual – a gluing together of moments in time accomplished in a visual medium, stressing associations and relationships. The narrative quality of PHC practitioner moves is manifested in their manipulations of nodes, links, and transclusions, providing explanations and supplementing earlier points, as well as creating structures that will be of use for future "readings" and "writings."

2.5.1   Definitions of narrative

Stories and story-making form a key psychological strategy for connecting disparate happenings, particularly 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" (Bruner, 1990: 49). The skill of the storyteller (or, more broadly, the narrative practitioner employing, consciously or not, story-telling strategies) lies in the artfulness and effectiveness with which they can craft an artifact that makes sense of the "breaches in the ordinariness of life" (Bruner, 1990: 95). This "astonishing narrative gift," which people employ every day without intending or realizing it, enables coherence to be drawn and communicated in even the smallest interactions, even (perhaps especially) in one's communication with oneself, making sense of the events of a day and drawing them into some soft of acceptable ("mitigating") comprehensibility. Theorists see this as both a developmental and a sociocultural construct, as will be described below.

Stories explain the breaches in the ordinariness of life and put them into understandable contexts. Stories do not inhere in "reality," they are always creative constructions, sequences of events woven into what appears to be whole cloth, in the service of explicating some exception to the mundane. Descriptions of the mundane in and of themselves are not stories, unless they rise to include some breach and its consequences.

2.5.2   Narrative as a developmental construct

Narrative theorists describe it as a basic human psychological mechanism active in all cultures and starting from babyhood. Narrative inheres in our every attempt to explain ourselves to one another, or even in our own self-telling to make sense of events. Bruner describes children in their cribs telling themselves "stories" about what happens in their day-to-day lives. Each such telling constitutes a selection, shaping, and sequencing of thoughts and events:

> The origins of narrative lie in early childhood development prior to socialization. Bruner refers to the narrative mode as "a primitive category system in terms of which experience is organized." He sees the perception of causation by six month old infants as integral to the later understanding of intention that finds its full development in the narrative mode of ordering reality. (Murray, 1995)

Bruner cites studies of small children beginning to select memories (if very recent) and experiences and put them together in sequences with explanatory glosses – this is why this happened, this is what happened next. These early stories find expression in crib talk (two-year-olds singing stories to themselves of what happened that day and what's going to happen in the day to come) as well as the explanations and excuses they offer to their parents and siblings about things they have done.

2.5.3   Narrative as a sociocultural construct

Bruner describes how exception-explaining mechanisms arise in each of us whenever we witness something transpire outside the realm of normal expectation. He gives as an example someone marching into a post office waving a flag, disrupting the lines of people placidly displaying normal "post office" behavior. Each person would, even in his or her own mind, construct an explanation for the flag-waver that locates the behavior in some framework, such as "it must be a holiday" or "obviously the person is crazy." These inventions, these "this happened then that happened because of this reason", are stories. The form these stories take is itself governed by cultural norms and expectations. Narrative theorists locate the notions of what constitutes the canonical and exceptional in the culture. We do not invent these "standards" ourselves; our ideas of what is canonical and what is exceptional are deeply rooted in our enculturation.

> All stories are told and ... all self-understanding is realized within the narrative frames each culture provides its members. These frames of intelligibility determine and limit the power of personal narrative. (Rosenwald & Ochberg, 1992)

We go through life acting within these standards, explaining our own actions and those of others according to definitions of what fits and what doesn't largely, or mostly, unconsciously absorbed from the cultural ether surrounding us. A culture could be said to be characterized by the interplay of its constituent, often widely divergent stories:

> To be in a viable culture is to be bound in a set of connecting stories, connecting even though the stories may not represent a consensus. (Bruner, 1990)

Bruner describes how this mechanism is a central means by which normal coexistence is made possible:

> Human beings, in interacting with one another, form a sense of the canonical and ordinary as a background against which to interpret and give narrative meaning to breaches in and deviations from "normal" states of the human condition. Such narrative explications have the effect of framing the idiosyncratic in a "lifelike" fashion that can promote negotiation and avoid confrontational disruption and strife. (Bruner, 1990)

Rosenwald and Ochberg (1992) call attention to the ways in which culturally imposed narratives limit the possibilities of developing more nuanced understanding of one's situation:

> Most narratologists … assume that the explanations individuals offer of their lives are inevitably shaped by the prevailing norms of discourse within which they operate… social influence shapes not only public action by also private self-understanding… the alternatives one recognizes as possible or moral are constrained in the marrow of individual self-representation. Those strictures in turn limit personal and political emancipation.

For some theorists, narratives follow a particular trajectory. On the level of the experience of both "writing" and "reading" a narrative, Alvarez and Merchan (1992) trace Ricoeur's "mimesis" process in three phases: *prefiguration* (the "mute experience of life, without meaning as yet, shared by every human being; the very stream of life"); *configuration* (the shaping of that experience by the acquisition of meaning, given by the author), and *refiguration* (the reader "developing a new grasp of reality that may change his or her acting"). The same trajectory could be applied to the collaborative writing and reading of a PHC knowledge representation. Moving from the prefiguration state of the group of participants (and practitioner) involved, where meanings are held in unquestioned (or undeveloped), "mute" state; to the configuration state in which practitioner and participants, from their separate vantage points, shape their experience into the representation; to the refiguration state where new meaning and consequent actions arise (and so on in a continuing cycle of configuration and refiguration). Skilled PHC practitioners are particularly active in the configuration step, aiding participants in moving from prefiguration to refiguration, the state in which previously discontinuous or inexplicable events attain a new (narrative) coherence; they've been placed in an understandable context or have been "mitigated" by assigning explicative annotations or

associations to them. Analyses of PHC practice that fail to address this dimension will miss the depth of skill and insight necessary to make the kind of connections a skilled practitioner is capable of. Understanding this has implications for both "author" (practitioner) and "audience" (participants).

This is reflected in Iser's (quoted in Bruner, 1990: 37) assertion that narrative works have both "artistic" and "aesthetic" poles. The artistic pole constitutes the text as the author created it, with all the techniques and manipulations of the medium it contains. The aesthetic pole is what the "reader" is able to do with the text – what it means to them, what sense they can take from it. This taking is a function of their own situation and capacities as much as anything the author has put into it. The "readings" a participant is able to make will always be contingent in this manner, never unproblematically available and inherent in the text itself.

2.5.4   Narrative as a practitioner stance

While acknowledging that narrative provides an enveloping frame for a PHC practitioner's work (i.e. narrative is occurring socioculturally and contextually beyond a practitioner's specific actions), my research will focus on the more active and intentional narrative stances and techniques that practitioners can take in service of the instrumental goals of the participants and themselves.

As we saw with sensemaking, narrative is a central mechanism to confront surprise and the confounding of expectations:

> The perpetual construction and reconstruction of the past provide precisely the forms of canonicity that permit us to recognize when a breach has occurred and how it might be interpreted. (Bruner, 1991)

Narrative practice provides the means for explicitly surfacing and visualizing canonicity and exceptionality in events and concepts. As we saw with sensemaking, narrative is a central mechanism by which to confront surprise and the confounding of expectations. PHC practitioners are actors in the narrative of the events in which they work (along with the participants), experiencing the breaches in canonicity that occur at sensemaking moments, but they also act as wielders of narrative strategies and techniques, crafting new narrative on the fly.

> Narrative therapists use narrative as a strategy to help participants (patients) do their own "healing" of breaches in their personal canonicities, "explaining the exceptional" and "forming bridges to the ordinary." (Murray, 1995)

Practitioner choice of moves, particularly in what they choose to include or exclude in the hypertext representation, reflects the construction of narrative: "We select salient details and omit others" (Dissanayake, 1988: 115). Organizational learning practitioners use narrative as an intentional strategy to promote participant self-understanding, as in the case of Argyris' technique assigning managers to write autobiographies:

They directly transform the author into both writer and reader of his or her own life, and in so doing it allows him or her to learn from his or her own experiences. (Alvarez and Merchan, 1992)

Taking an intentional narrative stance can yield insights that other approaches don't. Narrative finds expression not just in the mechanisms that give rise to personal or individual stories, but also in organizational life. "Stories" as objects used in such activities as "learning" is a subject well covered in the knowledge management (KM) literature, although (oddly) not often from the perspective of narrative theory. KM writers speak of stories as a (or the) principal method of "knowledge transfer" and repository of organizational meaning and memory, using terms such as "organizations as storytelling systems" (Boje, 1991), describing storytelling as "the preferred sense-making currency of human relationships among internal and external stakeholders." Stories arise and are told and retold, shaped and reshaped, in response to the needs of the moment.

Narrative thus becomes the vehicle for seeing a situation with fresh insight, especially in terms of exposing possibilities for change and personal agency. This is a central goal of narrative therapy:

> The challenge to analyst and analysand then becomes, "let's see how we can retell it in a way that allows you to understand the origins, meanings, and significance of your present difficulties and to do so in a way that makes change conceivable and attainable." (Bruner, 1990)

A school of dispute mediation uses narrative as a central strategy. This approach posits that a cornerstone of successful mediation is facilitating "the production of a coherent narrative" (Lovelace, 2001). For narrative mediators, the active creation of a new narrative to explain a conflict situation is a focus: "The process of healing deeply rooted conflict depends on finding new ways to express old issues" (Burton, 1990, quoted in Lovelace, 2001). Rather than focusing on the opposing sides of a dispute, narrative mediators focus on stories. The mediator's role becomes "active participant in the co-construction of the narrative" (Lovelace, 2001). This approach, based in the work of Augusto Boal, builds participants' capacities to define the issues in the dispute and freshly conceive of possible outcomes.

2.5.5   Narrative and transformation

The narrative frame is key to understanding the transformative potential of PHC practice. Narrative provides a key position from which to analyze practitioner moves for the perspective of their transformative potential, as practitioners help participants move from prefiguration through configuration to refiguration. Bruner describes how engaging in the construction of narrative helps us to be aware of our own perspectives, not just experience events in black and white terms. Such engagement leads to an "unpacking of presuppositions" (Bruner, 1990). As with the perspectives offered by aesthetics and improvisation theorists, it's the narrative object itself (in our case, the hypermedia representation) and the effort to construct one (the construction process) that acts to "create new structures of interaction, and stimulate new perspectives" (Lovelace, 2001).

For Boal and other theorists, engaging participants in the process of narrative construction can be a key "part of an internal dialogue that helps us order our world and theorize about the possibility for change" (Lovelace, 2001). In my analysis, I will look for how practitioner narrative moves play, in whatever small part, a role in participant reconceptualization of their situation and its possibilities for change.

2.5.6   Summary

Narrative is a basic human competence which can be understood both as an everyday strategy and as the product of skilled, intentional crafting. It operates as a developmental and sociocultural construct; as the latter, it is a principal way by which we are able to understand disruptions and unexpected events. Narrative operates, in different ways, across the divide between writers and readers; what an author intended gets taken up by readers in, often, widely divergent ways. As an intentional practitioner stance in disciplines such as narrative therapy and organizational learning, narrative helps participants make new understandings of their situations, which can be transformative in nature.

2.6   *Ethics*

My research emphasizes the role and ethics in understanding PHC practice. Some colleagues have questioned this focus on ethics. "Don't you just mean *choices*?" or "Are there really ethics involved?" or "ethics is a heavyweight term for what you're talking about." Indeed, speaking about ethics in PHC practice does run the risk of adding heaviness to an apparently technical topic. Yet it feels like a necessity to me, in part because ethical concerns were never far from my mind in the thousands of hours I spent performing PHC practice for groups of people in problem situations. "Should I do action *x* or action *y*?" "What effect will it have on these participants if I do *x*?" "Should I intervene in their conversational flow?" "Should I expend the effort to capture everything that person A is saying at this moment, or is the time better spent in cleaning up the representation or preparing for the next activity?" The answers to these (and similar) questions inevitably draw in ethical concerns – concerns about how my actions will affect the interests, emotions, sensitivities, participation, communication, and other capacities and aspects of participants. The actions taken by PHC practitioners have consequences for the people involved; therefore such actions are in the province of ethics.

Decisions about such actions need to happen with extreme rapidity in many PHC practice contexts. In the heat of the moment, there is not time to hunker down and weigh the possible ethical effects of actions. This does not lessen the fact that such choices are indeed ethical ones. The choices made reflect an *a priori* set of ethical concerns, and they have ethical consequences.

Rather than have this phenomenon remain an unquestioned and little understood aspect of PHC practice, I will attempt to define what I mean by "ethics" in these situations and point out how analogous practices and professions address ethical issues, in order to build a conception of ethics I can use in the broader analytical framework I'm trying to construct for PHC practice. If I'm successful in this, the benefits will be a clearer understanding of what PHC practice is, what the actions of a practitioner can mean, and perhaps a clearer vision of what kinds of actions are possible.

2.6.1   The need for a research focus on ethics

In many practices analogous to PHC (that is, practices involving facilitating the construction of a mediating representation for groups in problem situations), practitioners and theorists don't appear to see the need for an explicit focus on ethics. This focus, or lack of it, has been explored by some researchers.

Julie Salverson, a "theater artist" who works with political refugees and other disadvantaged groups, observes that most workers in that field believe that since the practice itself has explicit emancipatory or transformative goals, practitioners do not need to be self-reflective about their own actions and orientations, and at the very least this dimension has been under-explored in the research literature (Salverson, 2001: 169). She describes cases where practitioner actions, made with the best of intentions and employing techniques that are conventional in political theater, may actually deepen the

"injury" that some of the refugee participants (the intended beneficiaries) experience, forcing them to expose painful memories and feelings in public.

Aakhus (2001:362), in his study of GDSS facilitators, advocates research into their communicative actions so as to "advance the normative level of communication practice." He stresses that facilitators' work is not just a neutral enabler of participants' decision-making, or a simple "unfolding" of *a priori* processes, but contains many "instrumental" aspects in which practitioner choices directly affect participants and the course of events during sessions. The prevailing philosophy of such practice, however (derived from "process management", "adaptive structuration theory", and similar schools) obscures this:

> On the one hand, the philosophy [of process management] romanticizes communication as an unfolding process to be experienced. Yet, on the other hand, the philosophy treats communication as an instrument to be used in the service of particular ends. They justify their work by emphasizing how it allows processes to naturally unfold while downplaying the instrumental aspects of their work. (2001: 357)

Aakhus calls for looking more deeply at how practitioner choices actively shape and affect participants, processes, and outcomes. He goes on to state:

> Facilitators need a discourse about practice that helps them articulate how they *legitimately shape* the direction, content, and outcome of meetings in the way they orchestrate interactions. (2001: 364)

2.6.2   The scope of practitioner ethics

Practitioner ethics occur in particular situations at the intersection of the practice (methods, techniques, and tools), participants, representational artifact(s), and the practitioner him or herself (see Figure 3).
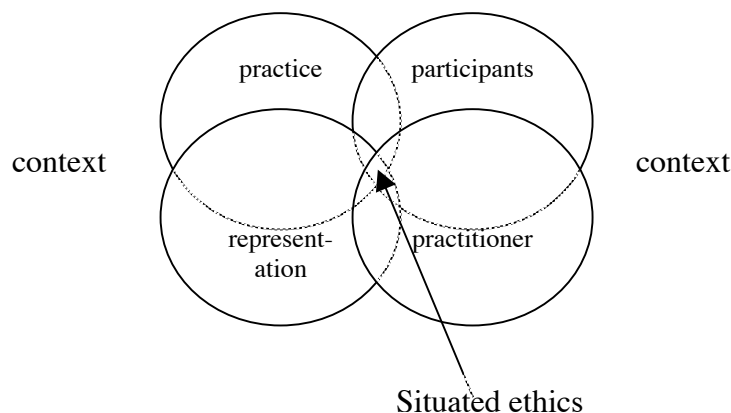
Figure 3: Location of situated ethics in practice context

Each combination of these at specific moments is unique, however strongly the similarities are to other situations in a practitioner's experience. It is the ethics of the actions at these moments, especially when they face "normative dilemmas" (Aakhus, 2001: 342) where practitioners must choose right actions without violating the boundaries of their roles, which are of interest. In the spirit of the ethical dimension of Schön's reflection in action, Aakhus uses the phrase "normative reflection" to describe the development of an ethical sense on the part of practitioners:

> The use of principles to invent reasons that resolve problems in a particular way, make trade-offs on competing goals, and the choice of particular techniques.

By doing so he puts the responsibility for making the choices (and engaging in normative reflection) on the shoulders of the practitioners themselves. Since there are, at present, no explicitly well-articulated or shared definitions of principles of ethics among PHC practitioners, my research will observe the kinds of ethical considerations implicit in the actions of expert practitioners (and such that can be surfaced through interviews and other means).

Simplistic conceptions of practitioner ethics place emphasis on the techniques and tools rather than the active choice-making of practitioners. Such conceptions obscure the nature of practice in these situations and possibly limit the effectiveness of practitioners that subscribe to them. As ethnographic observations of other sorts of expert professional practice have shown (Levina, 2001; Dreir, 1993), characterizing practitioners and clients as a group of disinterested actors pursuing a single unitary goal is an oversimplification. Rather, actors in problematic organizational situations always approach it and each other with a set of partially overlapping interests, goals, relationships, and concerns. Aakhus argues that "neutrality" is not an adequate self-conception for practitioners like dispute mediators to hold:

> The rationale dispute mediators commonly use to explain their neutrality frustrates practitioners, stifles innovation for individuals and the profession, and obscures political dimensions of practice. (2001: 362)

2.6.3   The inevitability of ethics

Ethics in practices such as PHC are unavoidable. Goffman (1967, quoted in Aakhus, 2001) points out that any "expert servicing" involved in "handling the problems of a client" involves "moral underpinnings." Practitioners are constantly making choices about what actions to take, whether they do so consciously and intentionally or not. Sawyer's analyses of improvisational actors and musicians show that there are effects in audiences (as well as other performers) in every such performance. Echoing Salverson, he implies that performers need to be conscious of these dimensions:

> The cultural function of all performances, both ritualized and improvised, includes a desired effect on the audience members. (Sawyer, 1996: 286)

Aakhus (2002:30) similarly observes the "interpretive and moral complexities of the work" of GDSS facilitators, despite that field's emphasis on a method-driven "technocratic" orientation to the facilitator role.

2.6.4　　Ethics in analogous practices

This section briefly examines conceptions of ethics in research into practices analogous to PHC, including documentary filmmaking, website production, improvisational and political theater, narrative therapy, GSS facilitation, dispute mediation, and aesthetic mediation.

The Practice as Research school seeks to apply academically rigorous research standards to the study of art practice and performance while remaining faithful to the creative and artistic nature of the research subject. Dowmunt's paper for the 2003 PARIP conference on autobiographic documentary video-making asks, "Why look at autobiographical filmmaking as a practice/research project" and answers:

> The significant degree to which problems – ethical, aesthetic, and epistemological – derive from the address of documentary work… the subjects of documentary …are necessarily subject to a degree of objectification – of 'othering' (Dowmunt, 2003)

At the same conference, Ellis's paper on the broadcast industry calls for closer critical research and reflection for both industry practitioners and academic researchers:

> We need a debate around the following questions in order to arrive at a generally agreed means of both carrying out and assessing practice-based research in this area … [including] means of developing critical reflection on practice within the industry and the academy [and] Means of assessing research aimed at changing production practices rather than products (e.g. 'more ethical' ways of making documentary). (2003)

In his dissertation, Voithofer (2000) examines his own experience as a web producer creating a website for cancer patients and that of his intended beneficiaries and contributors. He traces the evolution of the site from conception through implementation, analyzing his interactions with a community of cancer sufferers as well as the impacts of his own technical and aesthetic choices. Throughout he maintains an ethical stance of trying to understand what actions he could take that would be helpful to the community, his efforts to increase their level of engagement with the web site, and his partial failures and successes in achieving the social goals he had set.

Bruner's work on narrative therapy includes reflections on the ethical implications of such practice, particularly a focus on the values of both practitioner and clients. He speaks of an imperative to create "open-mindedness":

> I take open-mindedness to be a willingness to construe knowledge and values from multiple perspectives without loss of commitment to one's own values…. It demands that we be conscious of how we come to our knowledge and as

conscious as we can be about the values that lead us to our perspectives. It asks
that we be accountable for how and what we know. But it does not insist that
there is only one way of constructing meaning, or one right way.
 (Bruner, 1990: 30)

In Sawyer's analysis of improvisational theater, he gives as an example of an (implicitly)
ethical stance on the part of the performers the "no denial" rule:

> The single most important rule of improv is "Yes, and." In every line of dialogue, an
> actor should do two things: Accept the material introduced in the prior line, and add
> something new to the emerging drama. Everything that is introduced by an actor
> must be fully embraced and accepted by the other actors on stage. To deny a fellow
> actor is to reject whatever he has just introduced into the dialogue, and denial stops a
> scene dead. In a scene at the Improv Olympic Theater in Chicago, a man and a
> woman were taking a romantic stroll through the park … The woman had the idea
> that she would find a lottery ticket – a scenario rife with romantic possibility – but it
> didn't turn out like she planned. She initiated the scene change by pointing at the
> ground and saying, with surprise: Woman: "What's that?" Man: "It's just a pile of
> shit." Woman: (Frustrated) "No, it's a lottery ticket!" This is an outright denial.
> Once the man has defined "it" to be a pile of shit, the woman has to forget her
> preconceived idea about the lottery ticket plot, and accept that it is now a pile of shit.
> The problem started with her first turn, when she broke the "Yes, and" rule by asking
> a question; this question does not contribute anything new to the dramatic frame. She
> should have simply said "Look! A lottery ticket!" Good actors keep the scene
> moving by introducing something new to the dramatic frame with every turn. If an
> actor fails to add something, he is forcing the other actors to do more than their share
> of the creative building of the frame. The "Yes, and" rule encourages a democratic,
> collaborative performance. (2001)

Sawyer's analysis of Sufi improvisational singers construing themselves as "vessels"
rather than creative artists in their own right, "evoking" rather than "expressing" artistic
intent, is another implicit ethical stance (1996). They are defining their relationship to the
social (as well as spiritual) context of their practice – that of the participants (audience).
In other words, their ostensibly "aesthetic" actions (singing) have an implicitly social
purpose.

Salverson (2001) examines the ethical subtleties of the role of a political theater
practitioner, who works with various disadvantaged groups in an effort to help them tell
their own stories and "give voice" to their concerns in a theatrical setting. This work,
influenced by Boal (1979), is explicitly transformative in its orientation – that is, it seeks
to bring about a positive change in the social situation. Much of Salverson's analysis goes
directly to ethical questions, particularly those that have to do with practitioner self-
conception and stance towards participants and audiences, manifested in practices as
diverse as script-writing, rehearsal procedures, and public performances. Her thesis is that
neither holding a positive social agenda nor being proficient at the practice is ethically
sufficient. Rather, staying present to the particular situation and the relationship of each

participant to each others and to the effort within that situation is an ongoing ethical imperative, to avoid doing any further damage to already injured parties. She asks:

> What is my part in this work, this forming of accounts of lives into testimony, into performance, and what does it mean to me? If as an artist and educator I presume to talk about the ethical relation, I must consider the kind of person I am or may become, the me exposed, the me available to another.

> How can artist/educators, theatre participants and audience members find the resources to become an "I" capable of responding to the ethical call of the other? What is it to enact this "I" as a witness on stage? (2001)

This theme is carried into the work of other researchers and practitioners in the area of aesthetic mediation – using art practices in dispute or conflict situations to attempt to achieve reconciliation between the parties. Cohen (1997: 167) examines her own and other's practices in these often extremely sensitive efforts (for example, working with groups of Israeli and Palestinian women). In such contexts, the ethical consequences of practitioner efforts are heightened:

> Those who participate in and/or facilitate reconciliation processes must contend with seemingly contradictory imperatives towards mean and ends, justice and mercy, attention to individual and systemic change, empowerment and interdependence. Competing and even contradictory narratives lay claim to legitimacy, often with equally compelling vibrancy. The ability to maneuver within the realm of paradox and ambiguity is central to the educational work of reconciliation.

> Inherent in aesthetic forms and processes are ethical and epistemological possibilities that can be crafted to further the work of reconciliation. Part of "the crafting" of the form and the related processes include minimizing the ethical risks. (1997: 320)

This is echoed in Lovelace's description of the responsibilities of mediators using story-telling in a mediation context:

> Mediators are cautioned to view themselves as mediators of stories not sides. By focusing on the stories people tell instead of sides, mediators may be able to avoid the paradox of neutrality. … Story facilitation recognizes the mediator as an active participant in the coconstruction [sic] of the narrative. The narrative is greatly influenced by the way in which the mediation session is structured and by the interventions made along the way. Decisions such as who to see in a private session, what types of questions to ask, and when to hold private caucus are all seen as influencing the unfolding of the storytelling process. (2001)

Looking at another form of mediation, Jacobs and Aakhus (2002) focus on what Lovelace termed the "paradox" of mediator neutrality, a theme echoed in Bush and Folger's (1994)

work on transformative mediation. All of these require that mediators recognize the limitations (or impossibility) of operating from an ethical stance of neutrality, arguing that, intentionally or not, mediators make choices that emphasize or de-emphasize aspects of each disputant's 'side' and ways of expressing, listening to, and acting on disputant utterances and emotions. Jacobs and Aakhus also investigate the ethics and effectiveness of different mediator models and styles (e.g. bargaining, therapeutic discussion, critical discussion) in their emphasis on "mediation competence" and the "conduct of mediators."

Turning to an area closer to PHC practice, Aakhus (2002) examines the "transparency work" performed by GSS facilitators in an ethical light. He observes that facilitators perform this work to create "common ground" around a point of impasse between disputants "to create an impression of harmony and progress." This work, the result of "active crafting" on the part of the facilitator, is often invisible in accounts of GSS practice, though very present in observed sessions. Aakhus further critiques frameworks that de-emphasize the ethical "obligations and responsibilities" of particular mediation and GSS practices, arguing that "objectivity" is an inaccurate way to frame practitioner actions. Facilitators do in fact intervene in their clients' situations:

> The concepts, models, and rationales about argumentation, while often implicit, represent theories of what people and discursive systems are capable of in practical circumstances and what obligations are taken on in intervening to realize these capabilities. (2003: 228)

Finally, Schön (1983: 295-6) argues for practitioners to take active and conscious ethical stances, recommending reflection-in-action as the means to achieve this:

> The professional recognizes that his technical expertise is embedded in a context of meanings. He attributes to his clients, as well as to himself, a capacity to mean, know, and plan. He recognizes that his actions may have different meanings for his client than he intends them to have, and he gives himself the task of discovering what these are. He recognizes an obligation to make his own understandings accessible to his client, which means that he needs often to reflect anew on what he knows. . . there is the recognition that one's expertise is a way of looking at something which was once constructed and may be reconstructed; and there is both readiness and competence to explore its meaning in the experience of the client. The reflective practitioner tries to discover the limits of his expertise through reflective conversation with the client.

2.6.5   Summary

Practitioners need to be aware of ethical considerations in their work, even in ostensibly "neutral" practices such as group support systems facilitation. Ethical consequences play out in dilemmatic moments, when the interests and intentions of participants, representation, practitioner, and methods can collide or conflict. The fact PHC practitioners are typically involved in "expert servicing" highlights their ethical responsibilities. Many research disciplines, such as Practice as Research, improvisation and mediation studies, and others contain examples of how to understand their practices

in terms of ethics. Researchers like Schön and Aakhus provide guidelines for conceptualizing the ethics of practitioner/client relationships.

2.7 How aesthetics, improvisation, sensemaking, narrative and ethics inform each other

While the preceding five sections have treated the phenomena of aesthetics, improvisation, sensemaking, narrative and ethics separately, in practice they interweave with each other, and an understanding of practices such as PHC needs to recognize the overlaps. The table below begins to describe the ways in which these concepts intersect with and extend into each other in practice contexts.

Concept	Ethics	Improvisation	Sensemaking	Narrative
Aesthetics	Aesthetic actions – the shaping of form -- have ethical implications for audiences and participants	Particular "art forms", such as jazz and improv theater, foreground improvisational actions and/or take place in improvisational contexts	Disruptions and unexpected obstacles or dilemmas can force sensemaking behavior in the course of aesthetic making and crafting	The way that aesthetic choices are made is informed by the surrounding "stories" and story-making forms at the individual, group, and cultural levels
Ethics		Improvisational practitioners have particular ethical guidelines and considerations	It is often in sensemaking situations that practitioner ethical considerations come to the fore	Using narrative constructs can be an explicitly ethical stance in certain practices
Improvisation			It is at sensemaking moments that practitioners are forced to improvise	Breaches in the canonicity of events set the stage for improvisational actions
Sensemaking				The concept of breaches in canonicity is closely related to sensemaking; narrative constructs describe and constrain how practitioners are able to make sense of such situations

2.8 Computing research

This section provides brief summaries of how some strains of research in computing, particularly hypermedia, group support systems, and the situated activity and collaborative work areas of HCI and CSCW research, address the issues and concerns raised in the preceding sections. My future work will greatly expand these preliminary sketches.

2.8.1   Hypermedia

Practice-oriented issues are implicit in much current hypermedia research. That is, much research on new tools and techniques are undoubtedly informed by experiences in practice, but the literature rarely treats such issues directly.

Although there has been interest in hypermedia for group support and facilitation for many years (Conklin & Yakemovich, 1991), as well much work in using hypermedia in artistic contexts and as a literary and art form itself, there has been little research that directly addresses what it means to perform such practices from a practitioner point of view. Most work that touches on practice issues looks at concerns about novices learning to use hypermedia tools[6] (e.g. Bromme & Stahl, 2002), or examines the artifacts themselves, focusing on the "intellectual work" (Marshall, 2001) dimensions of hypermedia practice, with a somewhat functionalist view of what skills such work encompasses.

Many areas of hypermedia research focus on highly complex domains such as software engineering (Scacchi, 2002; Noll & Scacchi, 1999), library science (Nnadi & Bieber, 2004), and legal argumentation (Carr, 2003). Few would dispute that a high level of skill, training, and experience is required to be successful in such fields, however the specifically hypertextual aspects of the skills required to work with the tools are given little attention, almost as if to do so would be to admit some gap or deficiency on the part of the support technologies involved. Although many of these approaches implicitly assume a high degree of hypermedia literacy, skill, and even artistry on the part of their users, rarely if ever do such studies treat these matters explicitly. Indeed, promising hypertext approaches, such as the design rationale field in the 1980s and 90s (Fischer et al, 1996), have been dismissed or abandoned precisely because they appeared to require a high level of skill to perform effectively (which no one would begrudge the practitioners of the non-hypertextual aspects of those fields – e.g., no one would expect an architect or kitchen designer to pick up and expertly wield the tools of their trade in a couple of days).

---

[6] This is also true for other disciplines looking at professional practice. For example, Cross (2003) observed this for studies of professional designers: "Most studies of designer behaviour have been based on novices (e.g. students) or, at best, designers of relatively modest talents… if studies of designer behaviour are limited to studies of rather inexpert designers, then … our understanding of expert designers will also be limited. In order to understand expertise in design, we must study expert designers."

Even within the realm of hypertext fiction research, there is little attention paid to practitioner and practice issues. Most research in the field focuses on textual criticism of the artifacts themselves (Koskimaa, 2000; Miles, 2003), or on the navigation and reading of them, rather than on the process of construction itself.

When hypertext authoring skills are treated head on, it is most often in terms that emphasize connections to (as well as differences from) conventional notions of writing and reading (Landow, 1991; Barnes, 1994). These, while often valuable, only paint a portion of the picture. This is especially so when referring to the practice of constructing hypermedia representations for groups in real time, with the active participation of the members, rather than in building stand-alone hypertexts as a solitary activity, meant for solitary readers to review and navigate at later times. For example, Emmet and Cleland's study (2002) of a hypermedia tool used for constructing narrative and graphical representations of safety issues focuses solely on tool features as the means to address issues of authoring and representational complexity and sufficiency.

There are a number of specific issues in the field of argumentation-based hypertext tools that are highly related to my research. Most work in this area has treated the problems with these tools as aspects of the software and/or methodology itself, rather than addressing the practitioner side of the equation directly. One example is the rapidity with which users can create confusing and hard-to-navigate information spaces. "One problem with carrying out discussions in the construction space is that it quickly becomes cluttered. It does not take many notes to obscure the design artifact" (Reeves & Shipman, 1992). Conklin (1987) identified the "lost in hyperspace" problem with hypertext tools early on, and later researchers cite "the problem of disorientation and cognitive overhead" as hypertext "disadvantages." As hypertext information spaces grow large, the need for a coherent organizing scheme grows apace. Yakemovich and Conklin observed that "one of the major drawbacks of many design rationale (DR) methods is the missing macrolevel organization of the hyperspace" (1990). But authorship itself is not considered directly.

Researchers in design rationale-related hypertext (DR) have observed that users experience dissonance between the activity of "doing design" and the need to surface and record design rationale. Buckingham Shum (1996) cites "the difficulty of representing useful design rationale while engaging in artifact construction … rapid testing and changing of the [design] artifact, coupled with a reluctance or even inability to interrupt and articulate one's process" results in either incomplete design rationale or incomplete design, as well as some degree of user (designer) frustration. He goes on to invoke Schön's concept of "knowing-in-action" in characterizing skilled design as "spontaneous, skillful execution of the performance" in which designers "are characteristically unable to make [the rationale for their actions] verbally explicit." Conklin and Begeman (1988) noted that "it is somewhat unnatural to break one's thoughts into discrete units," an attribute of representing complex information domains in the node-and-link parlance of hypertext, "in particular when one doesn't understand the problem well."

Other researchers alluded to the role of a practitioner in such efforts, mostly indirectly and in a negative light, pointing to the large degree of time and effort involved to capture and represent design rationale, often involving third parties and considerable expense. Olson et al (1996) noted that "trying to capture the design rationales of our meeting discussion takes an enormous amount of coder time off line." Conklin and Yakemovich (1996) reported that the gIBIS approach seemed to work in actual project settings only with a scribe taking an enormous amount of time to capture and analyze rationale information. Fischer (1996) argues that "the costs of invested effort [using design rationale tools] exceeded the immediate payoff, " leading to user resistance and contributing to the "years of [failed] real-world and student projects" using IBIS-based approaches (Kunz &Rittel, 1970).

Many advocates of argumentation-based hypertext approaches have gone to some pains to elaborate formal structures for precisely representing design rationale, mandating that users make and record semantic distinctions in the course of design. Much of the literature contains arguments for the relative merits of various rhetorical models, such as QOC (Buckingham Shum et al, 1996), PHI (Fischer et al, 1996), DRL (Lee & Lai, 1996), variants of IBIS, and others. But many have found that, in practice, the sophistication of the distinctions that the structures provide also means that they are too complex or confusing to use, particularly in applied design settings (e.g. Buckingham Shum, 1996; Halasz, 1988).

In summary, these strains in hypermedia research certainly touch on some of the concerns discussed in the previous sections of this report, however they are usually treated as aspects or products of the tools or methods in use, rather than explicitly referencing practitioner experience and expertise.

2.8.2   Group support systems (GSS)

A large strain of GSS research has focused on the role of the facilitator (Bostrom et al, 1993), who operates the software and runs the sessions with groups. Facilitators play a key role by helping teams understand and work with the tools and conceptual frameworks, as well as by paying attention to "individual personalities, emerging group norms, and political realities" (Niederman, Beise, & Beranek, 1996) and ensuring that conditions are suitable for continuing development of shared understanding among the team. While there have been ethnographic studies such as Yoong's (Yoong & Gallupe, 2002; Yoong & Pauleen, 2004), much of this research possesses a "technocratic" orientation,"generally framed and studied as rational planning and instrumental action in the service of client goals"(Aakhus, 2004), versus a more grounded "design" stance that treats such "expert servicing" as products of the "communicative imagination" (as well as degrees of "moral" decision-making) of such practitioners (Aakhus, 2001). In order to understand PHC practice, we may well need to study the often invisible, and sometimes difficult to discern, "crafting and shaping" work such practitioners do (Aakhus, 2003). Studies emphasizing outcome-based measures, such as participant satisfaction (cf. Dennis et al, 1996), may reveal important aspects of their tools, but they often miss or obscure the aesthetic and ethical nuances of practitioner skill and agency (Aakhus, 2002).

2.8.3   Situated activity and collaborative work

The nature of expert practice has been a focus for the distributed cognition, social constructionist and situated activity schools in CSCW, HCI and related fields (Rogers, 2004). These researchers, such as Engestrom (1993), look at the various levels of interaction occurring in an actual life situation (as opposed to an idealized or laboratory setting), paying special attention to the ways in which social and historical context, interpersonal interactions, artifact creation, and tool use interrelate in a particular setting (rather than generalizing from that situation, or starting from general propositions and looking for evidence of their occurrence in the situation). These approaches illuminate such dimensions of expert practice such as problems and breakdowns, interdependencies between the actors, and the situatedness of practice (Rogers, 2004).

Related work such as Keller and Keller's analysis (1993) of an expert blacksmith's execution of a custom-ordered spoon for a museum, focus on the "open-ended processes of improvisation" that such a practitioner employs. Such research provides rich descriptions of not only the individual's actions and thought processes, but the way in which those processes interweave with other aspects of the context, such as cultural expectations and contractual relationships that inform and shape the apparently "individual" work of the practitioner.

Much work in these fields focuses on the "complex and demanding" coordination required in collaborative work settings, highlighting the need for people to perform "articulation work" (Schmidt & Bannon, 1992). They rarely, though, look at the skills of particular roles and individuals, preferring to focus on the distributed nature of such work as well as the social context of the work practices involved. An exception is research that examines the role of individual technology experts or "mediators" in making articulation work in new system implementations effective (e.g. Okamura et al, 1994).

2.8.4   Summary

This section barely begins to summarize the rich literature in the hypermedia, GSS, CSCW, and HCI fields that touch on some of my central issues. However, I have given a feel for how concerns of practitioner aesthetics, ethics, improvisation, narrative and sensemaking are addressed in these literatures, as well as a preliminary argument for what they don't address (at least not explicitly and directly). As discussed in the Proposal section of this document, my future work will greatly expand the preliminary work in this section.

2.9   *Analogous practices*

Analyses such as that which I am carrying out for PHC practice have been applied to analogous professional practices such as teaching, art therapy, and aesthetic facilitation, as well the work I have described earlier in this review, such as political theater (Salverson, 2001), dispute mediation (Aakhus, 2003; Bush & Folger, 1994), conflict resolution (Cohen, 1997; Lovelace, 2001), jazz improvisation (Sawyer, 1999; Schön, 1983), and others. In this section I will briefly describe a few additional examples.

2.9.1   Teaching

Researchers such as Voithofer and Ellsworth apply a range of aesthetic and ethical factors in their critical analyses of pedagogical practices and teaching. For example, Voithofer explores how

> traditional instructional design literature …often allude[s] to the artistic aspects of instructional design, however they do not articulate how this occurs, in part because it is an undefinable, unpredictable, unrepeatable and uncontainable part of the process. (Voithofer, 2000)

Ellsworth (1992) explores similar ground in an article describing her attempt to use "liberation pedagogy" as part of her practice as an educator of undergraduates at the University of Wisconsin, tracing how choices in curriculum design and classroom interactions with students align or conflict with her ethical aims.

2.9.2   Art therapy

The field of art therapy explicitly combines aesthetic and ethical considerations. While most practitioners come at it from backgrounds in psychotherapy, some approach it from art practice, such as Lygia Clark:

> Clark made no attempt to establish boundaries between therapeutic practice and artistic experience, and was even less concerned with preserving her status as an artist. … Clark's use of relational objects in a therapeutic context aimed at the promotion of emotional balance. The material simplicity of Clark's propositions confront viewers, however, with very complex issues about art, perception and body/mind relations. …. Clark was never concerned with self-expression in art, but instead with the possibility of self-discovery, experimentation, invention and transformation. She began with formalist problems about the exhaustion of representation in painting and ended, 3 decades later, in a form of synesthetic [*sic*] therapy. (Osthoff, 1997)

2.9.3   Aesthetic facilitation

There are a variety of practices involving the use of art and art-based methods to help organizations effect change, whether via individual leadership development, workshops focusing on developing strategies, or similar approaches.

Nissley (1999) employed a wide variety of art practices in organizational change settings (theater, stained glass making, and music among others). He used these experiences to develop an epistemology of "aesthetic ways of knowing in organizational life" (Palus & Horth, 2005).

In her dissertation, Orr (2003) developed and tested a "process in which artistic media are used to engage organizational members in collaborative learning, sensemaking and change," which she referred to as "aesthetic practice":

> Aesthetic practice is an organization development method that uses artistic media within a metaphorical perspective by actively engaged participants in the context of organizations. Aesthetic practice is an organization development intervention designed to engage several learning methodologies simultaneously through the use of art. (Orr, 2003)

Palus and Horth (2005) describe six types of "aesthetic competencies" discerned among participants in their work incorporating art-making in leadership development workshops:

> paying attention, personalizing, imaging, serious play, collaborative inquiry, and crafting… [these] aesthetic competencies are shown to support the sense-making and meaning-making functions of leadership, and are particularly relevant in conditions of uncertainty and complexity.

2.10   Research methods appropriate to this study

Characterizing the aesthetics and ethics of PHC practitioners is largely uncharted territory from a research point of view. As a principal goal of my research, exploring and "naming" this territory requires research methods that suit such an approach rather than those that proceed from well-formed, falsifiable hypotheses. In this section, I look at research methods that appear to be particularly well suited to my topic. The central themes are:

- the methods need to suit an emergent, inductive exploration of a phenomenon
- the need to study practice in situated contexts
- the need to triangulate among data gathered via different techniques

2.10.1   Studying practitioners

Various researchers stress the importance of looking at both macro and micro levels in studying practitioner aesthetics and ethics, recommending in situ analysis (e.g. Petre, 2003). Activity theorists prescribe understanding practitioner subjectivity in terms of its surrounding context:

> Individual subjectivity and action are always located. They can only be properly studied in the relation to a peculiar social context. (Dreir, 1993)

Sawyer advocates placing individual interactional moves as the focus of analysis, making them the entity that is related to the surrounding social context (per the socioculturalist agenda):

> Socioculturalists study multiple levels simultaneously by choosing as their unit of analysis the microprocesses of interaction during specific events. I believe this is the only way to understand group improvisation fully – its moment-to-moment unpredictability, its collaboratively created nature, its constant dialectic between individual creative actions and the collaboratively created flow of the improvisation. (Sawyer, 1999)

Schön prescribes four types of "reflective" research, aimed at deepened understanding of practitioner expertise and agency. "Frame analysis" looks at the way practitioners characterize their own role within a practice situation, comparing and contrasting to the role characterizations derived from other "frames" (such as a different theoretical school):

> In its more general form, this sort of frame analysis would help practitioners to experience the world they would create for themselves if they adopted a particular way of framing the practice role. It would convey the experience of problem setting and solving, the self-definitions and the definitions of success and failure, that would be inherent in a particular choice of role-frame. . . It would help the practitioner to understand the competences he would need, and the kind of person

he would become, if he framed his role in a particular way; and it would thereby support the practitioner's efforts at frame reflection. (1983: 314-5)

"Repertoire-building" research examines specific case histories to go beyond observable actions, outcomes, and context to

reveal the path of inquiry which leads from an initial framing of the situation to the eventual outcome. . . . [it should represent] the evolution of inquiry. . . (317)

Schön's third type, "overarching theory," undertakes to reveal the "methods and theories fundamental to a practice," the ways in which skilled practitioners are able to fit seemingly discontinuous, unique situations into their *a priori* conceptual framework. Such research would look at the "imaginative restructuring" by which practitioners perform this seeming transformation, as well as how practitioners are able to draw on the "themes" of their pre-existing framework so as to develop new "theories and methods of their own."

Finally, Schön advocates research on the "process of reflection-in-action" itself. This looks at the interweaving of not only the ostensible research subject (i.e. individual practitioners and their actions), but the role of researchers themselves in the larger social context of the practice under study:

researchers must take account of the interweaving of cognitive, affective, and group dynamic effects. As we try to understand the nature of reflection-in-action and the conditions that encourage or inhibit it, we study a cognitive process greatly influenced by "cognitive emotions" and by the social context of inquiry. In all such cases, the subject's feelings about the task, about his own performance, and about his relation to the researcher are essential parts of the process under study…. The researcher cannot exempt himself and ignores at his peril his own contribution to the social context of the experiment.... When the researcher adopts a strategy of combined observation and intervention. . . he may find that he can help his subject to reflect-in-action by allowing himself to experience and reveal his own confusion. (322)

2.10.2   Qualitative research methods

Qualitative research methods provide a variety of techniques for addressing contextual, phenomenological, and interactional factors, particularly when what is required is "exploring uncharted territory," which certainly appears to be the case for PHC practice. Contextual factors are key:

According to Denzin and Lincoln (1994), 'qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomenon in terms of the meanings people bring to them'. Swanson, Watkins and Marsick (1997: 92) state that qualitative research is most appropriate in human resource development for building new theory... and for exploring uncharted territory'. Casell and Symon (1994: 7) state that 'qualitative research can be said to have a

number of characteristics which include: a focus on interpretation rather than quantification; an emphasis on subjectivity rather than objectivity; flexibility in the process of conducting research; an orientation towards process rather than outcome; a concern with context regarding behaviour and situation as inextricably linked in forming experience; and finally, an explicit recognition of the impact of the research process on the research situation'. (Sankaran, 2001)

The task of a qualitative researcher is to "enter the situation so deeply that they can recreate in imagination and experience the thoughts and sentiments of the observed" (Christians & Carey, 1981: 347). This is in order to better understand the "meanings that people use to guide their activities." Qualitative research is particularly suited to areas of study such as

> research that attempts to uncover the nature of persons' experiences with a phenomenon... Qualitative methods can be used to uncover and understand what lies behind any phenomenon about which little is yet known. (Strauss & Corbin, 1990: 19)

Such research, since it examines little-understood phenomena, often must start with "fuzzy questions" (Dick, 1993) for which initial answers and even method choice will also be "fuzzy." Many qualitative researchers emphasize the cyclic or spiral nature of the approach, whereby increasingly precise and "sensitive" concepts emerge over time through repeated rounds of the cycle:

> Repeated observation is necessary to clarify an emerging concept, which in turn improves the quality of further observation. Sensitive concepts must be continually tested, improved, illustrated differently and refined by further encounter with the situations they presume to cover. (Christians & Carey, 1981: 359)

Approaches such as action research recommend an intentionally cyclic approach, continually raising, clarifying, and challenging emergent meanings and interpretations:

> use a cyclic (or "spiral") procedure. In the later cycles you can then challenge the information and interpretation from earlier cycles. Both the data you collect, and the literature you read, are part of this. In effect, your study becomes a process of iteration. Within this process you gradually refine your understanding of the situation you are studying. (Dick, 1993)

In my own work this first year, I have completed what could be considered one "turn" around this iterative cycle. I started with some rather fuzzy questions, did some initial readings, tried a few different qualitative data gathering approaches with different data sets, and am now able to revisit the ideas I started with, challenging and adding nuance to them, as well as setting the stage for the next set of inquiries, I will describe these activities more fully in later sections of this report.

Christians and Carey (1981) list four criteria by which to judge qualitative studies:

naturalistic observation (immersion in various methods and levels); contextualization, maximized comparisons (choosing appropriate groups to compare subject groups to), and sensitized concepts (taxonomical systems composed of meaningful and nuanced characterizations). Contextualization in qualitative studies can be multidimensional:

> Cultural life is intricate and emotionally complex, symbols requiring a multitude of nuances for their proper exegesis. Exploring one context usually exposes another, and the richness of particular events is uncovered only as single situations are fit within their multiple contexts. (351)

Choosing cases for comparative analysis in qualitative studies requires somewhat different criteria than in a quantitative study:

> Comparative analysis requires carefully selected cases without any claim to knowledge of the whole field or that random sampling was strictly satisfied. (354)

Drawing from its roots in the humanities, qualitative research places great importance on the development of precise and evocative language to describe the phenomena it examines, requiring

> expressions that develop an insightful picture, which distinctively convey the meaning of a series of events… taxonomical systems that discover an integrating scheme within the data themselves, whether by minting special metaphors or creating analogies or using direct expressions, the qualitative researcher maps out territories by finding seminal ideas that become permanent intellectual contributions while unveiling the inner character of events of situations. (357-358)

2.10.3   Comparisons to quantitative methods

Advocates for qualitative approaches stress the different emphases and "affordances" of qualitative modes of inquiry as against quantitative approaches. Marshall and Newton echo Schön's position in this:

> Scientific inquiry, like any form of inquiry exposes only certain kinds of problems and validates only certain kinds of solutions. The kinds of problems scientific inquiry has most difficulty in exposing are precisely the kinds of problems and situations faced by practitioners: problems and situations that are complex, uncertain, unstable, and unique, often articulated across conflicting value systems. The kinds of solutions offered through scientific inquiry (descriptive generalisations) have little relevance back to the situations of practice. (Marshall & Newton, 2000)

Qualitative research has a different approach to such questions as validity and replicability. For example, action research theorists argue that, by being explicitly concerned with bringing about changes in a complex situation, such research must emphasize "responsiveness" over replicability:

replicability and responsiveness are hard to achieve at one time: you trade off one for the other. Conventional research sacrifices responsiveness in the interests of achieving replicability. That is what often makes it unsuitable as a change technique. Action research values responsiveness over replicability, because otherwise it is very difficult to achieve action as part of the research. (Dick, 1993)

Validity is as key a concern in qualitative research as quantitative, but it can take different forms:

Contextual validity is a concept used in field research and refers to how well a piece of data fits with the rest of the data obtained, while 'catalytic' validity relates to emerging possibilities. Reason and Rowan (1981: 249) define validity as that which is "not only right but useful or illuminating to the actors". Validity can also be defined as the property of being 'well founded' (Heron, 1988), based on a 'triangular' combination of aspects of the presented world, the posited world and the researched world. In action research and co-operative inquiry two-way positive and negative feedback loops and action-reflection-analysis cycles are used to enhance validity by successive movement towards a best available description, explanation and plan for action. (Holian, 1999)

Qualitative approaches can particularly help with addressing such complex and subtle issues as the ethics of practice in fraught organizational or social contexts, addressing ethical concerns on the part of both practitioner and researcher. Holian describes an action research approach to both studying and effecting change in an organization, paying special attention to ethical issues:

I was researching decision making, in particular ethical issues and decision making. I was also keeping a journal, reflecting on and re-examining my own thoughts, feelings, behaviour and practices in relation to teaching, learning and making decisions about ethical issues. My project had a dual purpose, to change practice in my own organisation and to understand it in order to inform future action. Through processes of observation, participation, reflection and feedback I became 'fully engaged in body and mind' in attempting to change, understand and describe ethical decision making behaviour. (Holian, 1999)

2.10.4 Analytical taxonomies

A key goal of qualitative research is to create and refine taxonomical understandings of phenomena. Christians and Carey speak of the "general task of qualitative studies – to make us aware of the categories in which we think and to analyze and critique such models." (Christians & Carey, 1981: 346) This requires deep immersion in the situations of practice under study. A key consideration becomes how to separate the "wheat" from the "chaff" – the voluminous data produced by such immersion. This requires "exegetic" skills, such as "reading situations or documents with grammatical precision", and avoiding "blurred grammatical categories … without the laborious attention to lexical details which demonstrates that the analyst has distinguished literal and figurative" (Fortner & Christians, 1981: 366).

2.10.5   Specific techniques

There are a wide variety of qualitative research techniques, too numerous to catalog and describe here. I will mention several areas that seem of particular relevance to the phenomena I am studying.

Many fields of research have identified particular subsets of such techniques, such as those central to social informatics (the study of the social and organizational aspects of information systems):

> These discovery processes include *workplace ethnography* (Simonsen and Kensing, 1997), *focus groups*, *user participation in design teams* (Bolstrom and Heinen, 1977b; Carmel, Whittaker and George, 1993), and *participatory design strategies* (Schuler and Namioka, 1993; Eckehard, et al. 1997). (Kling, 1999) (italics added)

Grounded theory prescribes a set of techniques for deriving a framework of concepts from data gathered through participant observation and other methods, emphasizing the process of data-driven inductive reasoning:

> A grounded theory is one that is inductively derived from the study of the phenomenon it represents… one begins with an area of study and what is relevant to that area is allowed to emerge. (Strauss & Corbin, 1990: 23)

Yoong & Gallupe (2002) employed grounded theory in their study of GSS facilitators. Orr (2003) used it in her study of aesthetic mediation in organizations.

The *Practice as Research* (PaR) school (Mcleod, 2000) combines qualitative methods with techniques more usually associated with the humanities, such as aesthetic and critical analysis. Its aim, derived from a UK Arts and Humanities Research Board project, is to approach what are ostensibly "art" practices with explicit and rigorous research questions and methods, making a "clear statement of aims and objectives linked to a methodology which is appropriate to the inquiry, and positioned within the field of knowledge, through the construction of argument" (Douglas et al, 2000).

Biggs and others emphasize that PaR can't just be about improving the researcher's own (art) practice; just as with other forms of research, this work must contribute to the field and address valid research questions:

> We need to differentiate between activities that are to do with the personal development of the practitioner and his or her creativity, and activities that are significant for others in the field. It is only an activity that is significant for others that can be regarded as research. Personal development does not make a contribution to the 'advancement of knowledge, understanding and insight', except in the most parochial sense, i.e. my advancement. (Biggs, 2003)

What distinguishes PaR from forms of action research is a) the explicitly aesthetic character of the practice under study, and b) that the researcher's own aesthetic practices

can be incorporated into the research, under the aegis of well-considered research methods and clear research questions.

Critical incident analysis (which I employed as part of the Finding Waypoints study described later in this report) highlights particular events that "stand out" from a larger situation in some way, as in this example from education:

> A useful tool for reflecting on teaching is the identification of `critical incidents'. A critical incident may be a commonplace, everyday event or interaction, but it is `critical' in that it stands out for you. Perhaps it was problematic, confusing, a great success, a terrible failure, or captures the essence of what you are trying to achieve in teaching and learning. (Tripp, 1993)

The technique is used widely in both training and research contexts. Selecting incidents to focus on requires careful consideration. An account should include:

> a set of procedures for gathering and analyzing reports of incidents, actual behaviors observed first hand, that involve "certain important facts concerning behavior in defined situations" (Flanagan, 1954: 335). Incidents typically include three features: a description of the situation, an account of the actions or behavior of the key player in the incident, and the outcome or result. Incidents are typically reported as examples of "effective" or "ineffective" actions. (Fountain, 1999)

Clawson (1992) and others have used critical incident analysis to study GSS facilitators.

Transcript analysis involves the study of verbatim transcriptions of events, for example mediation or facilitation sessions. Transcripts provide a rich data source to discern and examine each practitioner move and the engagement of participants with each other, the practitioner, and (to varying degree) any mediating representation. This technique (also used in my case study) is employed by Jacobs & Aakhus (2002), Aakhus (2003), and Bush & Folger (1994) in their close analyses of dispute mediator moves in a wide variety of contexts. Yoong & Gallupe (2002) used transcript analysis in their study of GSS facilitators.

In PHC practice, just as with PaR, in addition to the words spoken by practitioners and participants, a key focus for analysis must be the hypermedia representation itself. The analyst should grasp the ways the meaning it contains and encodes are developed and changed over time. *Hermeneutics* provides techniques for textual interpretation of these representations:

> Hermeneutic interpretation is required when there is neither a rational method of assuring the "truth" of a meaning assigned to the text as a whole, nor an empirical method for determining the verifiability of the constituent elements that make up the text. In effect, the best hope of hermeneutic analysis is to provide an intuitively convincing account of the meaning of the text as a whole in the light of the constituent parts that make it up. (Bruner, 1991)

2.10.6   Triangulation

A central concept in qualitative research is *triangulation* – the use of multiple methods, each with different data collection techniques and analysis strategies, in order to examine a phenomenon from multiple perspectives. Triangulation can take many forms:

> The goal is to build up a fully routed analysis of some phenomenon by combining all lines of attack, each probe only revealing certain dimensions of the symbolic reality. The point is not to advocate eclecticism as such, but to avoid the personal bias and superficiality that stem from one narrow probe. Triangulating takes seriously the way we attach meanings to social reality and the fundamental elements of symbolic interaction embedded in the research process. (Fortner & Christians, 1981)

The emphasis on triangulation is found in many theorists, such as Bourdieu:

> Bourdieu argues that a sociological researcher must try, in every case, to mobilize all the techniques that are relevant and practically usable, given the definition of the object and the practical conditions of data collection (Bourdieu and Wacquant 1992: 227). In other words, he rejects the supremacy of either qualitative or quantitative methods, arguing that different methods have to be used and their results triangulated to get a better understanding of the problem a researcher sets out to understand (Bourdieu and Wacquant 1992: 225-227). (Levina, 2001)

The same emphasis, referred to as "dialectic," is found in Dick's guidelines for action research (1993).

Examples of triangulation can be found in many studies with similar approaches to my own. For example, Aakhus triangulates between grounded theory, individual interviews, participant observation, and focus groups in his study of GDSS facilitators (2001). In the PaR realm, Graham (1997), in her study of both the making of and museumgoer response to computer-based interactive artwork, argues that "hybrid media require hybrid analysis" and triangulates between observation, art practice, and curation studies. Yoong and Gallupe (2002) triangulated among "semi-structured interviews, participant observation, personal journals, and video recordings" in their study of GSS facilitators, observing that they were "thus provided with a collection of diverse 'slices of data' that enhanced the use of the constant comparative method."

2.10.7   Summary

This section has summarized a small number of threads in the vast literature on qualitative research methods, highlighting concepts and techniques that I have begun to apply in my own work. In my first year of study, I have performed transcript analysis of PHC practices, reflected on my own practice through a variety of lenses, undertaken hermeneutic analysis of PHC representations, and iterated through at least one cycle of intend-act-review (Dick, 1993). I have also begun to try to synthesize and triangulate between these methods. In the Proposal section of this report, I will outline a specific plan that knits together some of these threads.

3 Practical report

This section describes the practical research work I have performed since October 2003. This comprises three main activities:

- initial experiments (December 2003 - March 2004)
- grounded theory analysis of an episode of PHC practice (May 2004 - October 2004)
- critical incident analysis of segments of an episode of PHC practice (October 2004 - January 2005)

Each of these activities placed aspects of my initial thinking into clearer focus and caused me to question and refine my assumptions, categories, methods, and understanding of the research literature. The initial experiments sharpened my understanding of the narrative and participatory aspects of constructing hypermedia representations, with implications for both the technical (computing) and methodology aspects. In addition, they gave me experience conducting participant observation, action research, and qualitative data analysis. They also made me rethink the concept, scope and scale of my planned project, raising concerns about how I would find *in situ* subjects and what I would do if the subject group's needs diverged from the needs of my research plan. I presented initial findings from these activities at KMi in February 2004. [7]

In April 2004 I had the opportunity to participate in the 2004 Mobile Agents Field Trial (Clancey et al, 2005), which resulted in a very large dataset of audio and screen capture recordings of field PHC practice. Since this appeared to hold out many of the same opportunities for deep qualitative analysis of a corpus of PHC practice as my planned action research project, without many of the risks, I turned to a grounded theory analysis of a portion of this data. That occupied many months, both because the dataset was so rich and simply constructing a detailed audio and screen-move transcript took far longer than I imagined, and also because the kinds of concepts and categories that began to emerge kept me returning to the data for subsequent passes so as to analyze from fresh perspectives.

Once I had completed that analysis I had a compelling set of initial results, which I presented at both the Mars Society 2004 conference[8] and at KMi in October 2004. I also developed data collection and analysis methods, which I employed in the CO-OPR field experiment conducted at the Joint Forces Command Center in Norfolk, VA in September

---

[7] See "Building Collaborative Knowledge Representations in Real Time: An Analysis of Facilitative Micro-Actions",
http://stadium.open.ac.uk/stadia/preview.php?s=29&whichevent=494

[8] See "Facilitating Remote Science Teams,"
http://kmi.open.ac.uk/people/selvin/presentations/FacilitatingRemoteScienceTeams.ppt

2004, gathering data during the trial and writing an evaluation of practitioner activities afterward.[9]

At this time (October 2004), I felt that although it had been richly generative, the grounded theory analysis did not get to the depth of insight that I hoped for about how and why practitioners make individual hypermedia "moves" and how such moves could be characterized in terms of my principal interests (aesthetics, narrative, improvisation, sensemaking, and ethics). To address this, I took a critical incident analysis approach, looking in much more depth at a few key segments of the session I had done the grounded theory analysis of. In the course of this work, further clarity and refinement of my categories and framework emerged, and I gained experience in writing narrative descriptions of PHC practice according to this emerging framework, incorporating my principal interests.

The following sections provide results of these activities, with the bulk of the report consisting of the detailed critical incident analysis.

---

[9] See "CDRL A002AA – Integrated Battle Command Decision Support Systems: Experiment B Report for Co-OPR Application", http://www.aiai.ed.ac.uk/project/co-opr/expt/coopr-exptb-report.pdf

3.1 Initial experiments

In December 2003, after a period of initial literature review, I began my first experiments in constructing narrative hypermedia. My intent at the time was to build toward an action research project in which I would act as the practitioner, engaging a group of people in a long-term project whereby they would construct a large-scale participatory hypermedia representation of their problem situation, comprising explicitly "narrative" (that is, fictional) elements in addition to analytical and discussion elements. In order to do this, I felt that I first needed to construct a fictional hypermedia representation myself (having never done that before), so that I could better guide participants through such an exercise, then to perform an initial small-scale experiment in collaborative fiction hypermedia authoring, so that I could gauge how well the approach might work in actual practice.

I accomplished this in three stages. First, I built a number of "stories" in hypertext using the Compendium tool. Next, I showed these stories to colleagues and others for their reactions. Then, I created a plan for how a long-term engagement might work for my action research projects.

3.1.1 Building hypertext stories

In December 2004, I spent the majority of my research time on some initial experiments with creating fictional stories using Compendium. This felt to me like a necessary step to take in working towards the formulation of a new transformative/aesthetic mediation practice using Compendium. My goals for this were to "get my feet wet" with artistic use of this medium, push on what the tool could be capable of from an expressive point of view, see if I personally was capable of creating meaningful fiction in this manner, create some texts that could be used in some additional preliminary experiments allowing others to modify and interrogate them, more intangibly perhaps, to open whatever doors would get opened by attempting such a practice: I needed to discover and learn what it meant to try to use this medium artistically, and I couldn't do that without actually trying it myself, and finally, I believed that I needed to review the literature on fictive hypertext (as I briefly describe above) from the perspective of some analogous experience.

Setting out on this path required me to overcome quite a bit of both fear and inertia. These were because I believed it would be difficult for me to make any worthwhile, coherent "art" in general, and with Compendium in particular; that any attempt would seem contrived, an "artificial" use of the medium, and/or embarrassing. I dithered and avoided for some time, but finally in early December came up with an initial idea for a story (based on a dream) and set out to render it in Compendium. That first attempt took about two days of work, including creating the initial version, publishing it as HTML pages and showing it to a few people, getting some initial feedback, then revising and republishing it. I was encouraged enough by this to continue working in that manner for most of the rest of December and into early January.

In all in this period I created three full-fledged stories and one vignette and wrote over 25 pages of reflections on this activity. Doing this had a number of positive results. It gave rise to a number of ideas for more preliminary experiments (some described in the

following section), allowed me to feel that I could now review the fictive hypertext literature as a peer rather than an outsider, drove the creation of a number of ideas for further features and capabilities of the Compendium software, and gave rise to some interesting aesthetic and technical questions (and dilemmas) that bear further investigation.
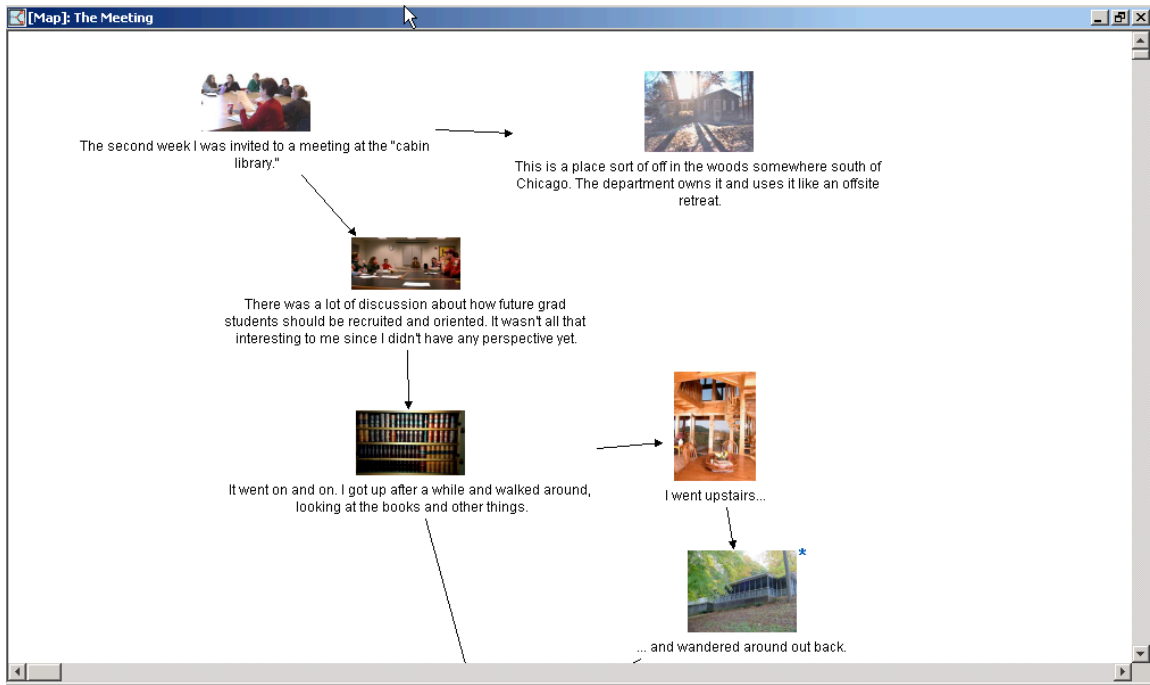
Figure 4: Portion of a story map, one of five maps in a particular "story".

Giving a full description of the above phenomena as they related to the construction of the actual stories would consume many pages, so I will try here to summarize what I learned and experienced in this stage. Although I feel some degree of mastery in "conventional" Compendium practice in a facilitative context (creating and modifying representations of a group's discourse on the fly), I felt like an amateur or beginner in this fictive use. It did not come easily or fluidly. I had to spend long hours in painstaking (and minute) adjustments and shaping of the images, arrangements, and texts. While by the end of the few weeks of working this way, I did begin to feel more comfortable, I also did not make much progress in silencing the "censor" (this isn't worth doing, anything I try to do will be bad, thousands of other people could do this more artistically and expressively). There were a number of aesthetic issues and dilemmas that arose in the course of constructing the stories, such as what the most effective treatments(s) of narrative and caption text are (as labels to the same nodes with the images? As separate 'text' nodes linked to the image nodes?). I won't detail these further here as they are somewhat off the main topic of my research, but they will come up in the course of instructing people how to make stories in this medium so are probably worth further exploration. The main questions doing this work raised for me:

- Can this work (fictive pictorial hypertext) be done collaboratively?

- Can doing so be done in a transformative/mediation context? Can the task of collaborative construction of a fictive pictorial hypertext with multiple narratives serve a transformative goal?
- What are the practitioner ethics/aesthetics of doing so (i.e. what should the role of the practitioner be)?

3.1.2 Initial action research plan

After the initial solo work described above, I created a conceptual plan for a collaborative authoring of a dialogic pictorial hypertext intended to foster communication between communities, especially in mediation or reconciliation settings. The plan built on a number of streams I had explored up to that point:

- art-based methods for fostering dialogue and sensemaking
- transformative mediation
- dialogue mapping and argument visualization
- collaborative hypermedia

The plan consisted of a set of phased events. In the first round, a PHC practitioner would present a summary view of a problem situation based on previous interviews with participants, rendered in Compendium. The view would present the main positions of the participants with regard to the central issue(s). The practitioner would talk through the view (see Figure 5) and ask the participants to confirm that it fairly presented the main issues. If discussion or argument arose, the practitioner would ask that they be held for later rounds.
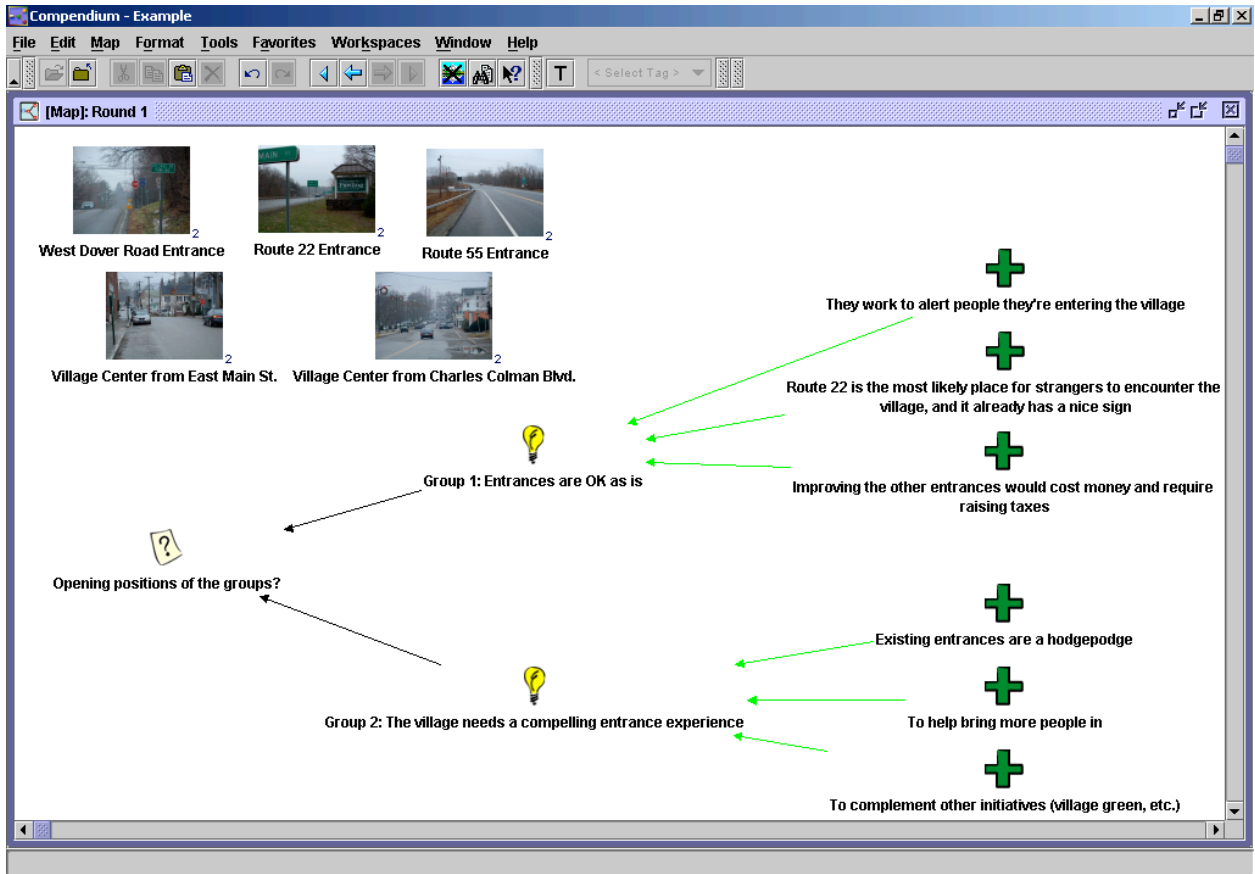
Figure 5: Example of Opening Summary View Generated by Practitioner

I created a fictional example to demonstrate how this could work. In the example, the issue is a (fictionalized) conflict in a small town over how the various road entrances to the town (the "entrance experience") should be designed.

In the second round, the practitioner would show a "seed" fictional narrative story. The practitioner would talk through the story and demonstrate the various techniques available for amending, rewriting, changing, etc. its contents. Then, participants in at least two groups[10] (comprised of at least two people each) would be instructed to use the software (working apart from the other group(s)) to recast the seed story in terms that showed their own community's perspective on the events, or that provided an alternative story that more closely reflects their concerns and sensibilities (see Figure 6).

---

[10] The groups could be (for example) clients and service providers confronting an issue over deliverables; management and union workers in a business setting; teenagers from different neighborhoods; representatives of different communities in a public policy dispute; etc.
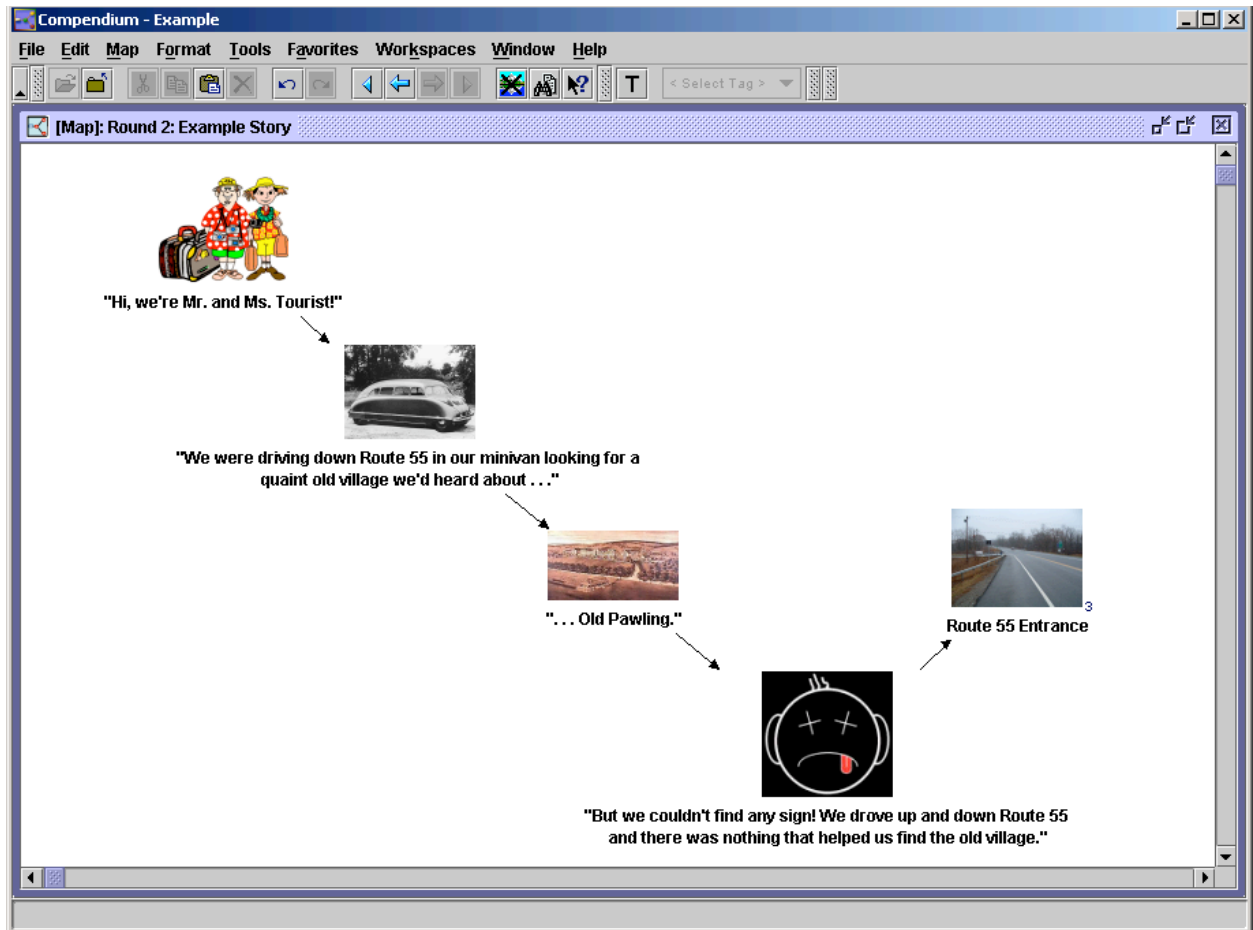
Figure 6: Example Portion of Second-Round Story Created by Group 2

In the third round, participants from each group would present their recast story to the larger group. First they would talk through their story without interruption, then the other group and facilitators will be allowed to ask questions and make statements about the recast story. These statements, and the resulting dialogue, would themselves be captured and incorporated into the hypermedia software representation (see Figure 7). The practitioner would intervene in the discussion only as necessary to ask for clarification and assist the participants in representing their statements as clear questions, answers, or arguments, following the principles of dialogue mapping (Conklin, 2001). When the first group completes the cycle of presentation and discussion, the second group would then present their story, followed by discussion.
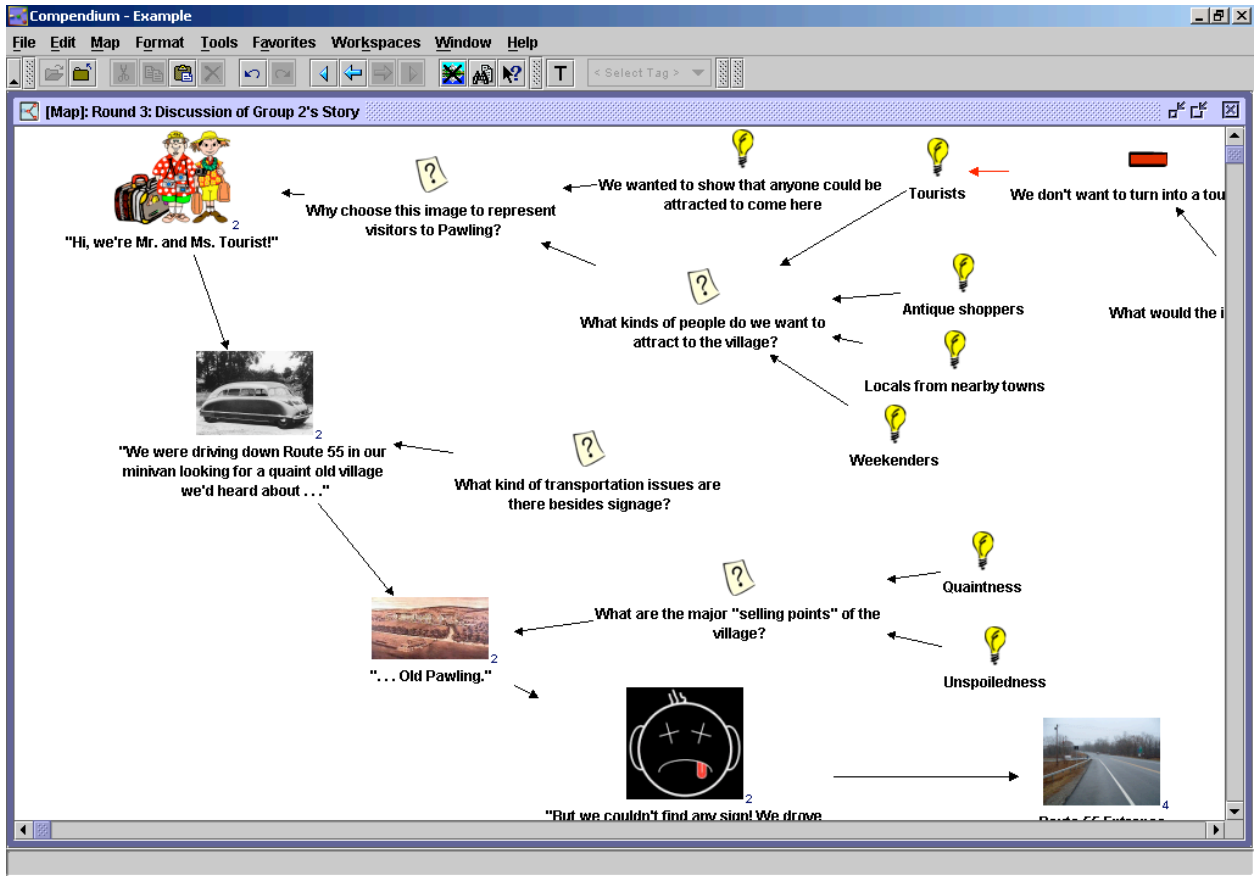
Figure 7: Example of Third Round Dialogue Using Groups 2's Story

In the fourth round, participants from the groups would be mixed and create a new story (or build on one or more of the existing ones), building on the insights or issues raised in the previous round. Once the stories are constructed, the larger group would reconvene and repeat the cycle of presentation and discussion.

In the concluding round, the practitioner would assist the plenary group in crafting a set of summary insights, statements, or questions emerging from consideration of the previous rounds. These would then be related (linked) to the specific areas of the hypermedia representation they refer to. The proceedings would then published as a set of web pages that the participants can use for subsequent work.

3.1.2.1 Rationale

This approach drew from several streams. The first stream drew from work that me and my colleagues at Verizon, the Knowledge Media Institute (KMi), and the Center for Creative Leadership (CCL) had developed for workshops on leadership development that engage participants using art-based approaches for fostering dialogue and collaborative sensemaking. These tools include the Visual Explorer method using evocative pictures for exploration of complex ideas, and a paper-based story-boarding technique called "Movie-Making" that engages groups in creating large collages that combine story-telling and scenario-building (Palus et al 2003), and various techniques for brainstorming,

dialogue mapping, and visualized sensemaking using Compendium (Selvin and Palus 2003).

Another stream drew from the kind of aesthetic reconciliation work exemplified by Cohen (1997), as well as embodying the principles of the transformative mediation movement (Bush and Folger, 1994) among others. In this work, aesthetic artifacts are used to mediate between people involved in disputes. The principle is that art can provide the "something in the middle" that gives participants an expanded space for dialogue and frees them from the constraints of a rationalist approach to discussion. Art methods enable enhanced expressiveness and foster sensitivity to the emotional, personal, and embodied aspects of a dispute situation. By having participants both express themselves via an artistic medium, and relate to each other with reference to such expressions, participants will both be more receptive to the 'opposing' group's situation and sensitivities, and be more confident that they themselves have been able to make their own perspective known and felt.

This approach would have provided a template both for a *design experience* – a structured method for engaging participants in the creative as well as analytical components of design – as well as for *experience design* – the generation of designs incorporating multiple participant perspectives and skills, based on empowerment (confidence in the ability to express the nuances of one's own viewpoint) and recognition (the increased ability to listen to and understand the viewpoints of others (Bush and Folger, 1994)). In the fictional example I created, different members of a community were able to tell their sides of a contentious debate about roadway entrances to their village, in a framework allowing subsequent dialogue, exploration, and reframing of the issues.

3.1.3 Initial experiment in collaborative fictional hypermedia construction

In February 2004 I ran an experiment at KMi with ten participants engaged in a collaborative hypermedia fiction-building task. To do this, I first gave a "reading" of one of the stories I had produced in the "building hypertext stories" work. I then divided the participants (composed of faculty and graduate students) into two groups and asked each to extend the stories working collaboratively in Compendium. They were given free rein to extend the stories. I provided some suggestions for possible themes, such as making them "more British" or more humorous. Each team grouped around a computer running Compendium, and in the course of 90 minutes wrote, illustrated, and refined their stories. They then presented the stories to the other team, projecting Compendium over an LCD projector and reading the text out loud while one of the team clicked through the various maps and nodes. As they worked and presented, I observed the teams and took notes on paper. I also used screen-and-audio recording software to capture each team's work for later analysis. Following the presentations, I facilitated a debriefing session where all the participants reflected on the experience. As people spoke, I captured their comments in

the live Compendium display, asking for validation to be sure I'd transcribed or paraphrased correctly.[11]

Later, I used Compendium to analyze the videos, taking additional notes. I then grouped these with my observational notes and the debrief comments into categories and themes, then published the results as a Web document that I sent to participants for additional validation and reflections.
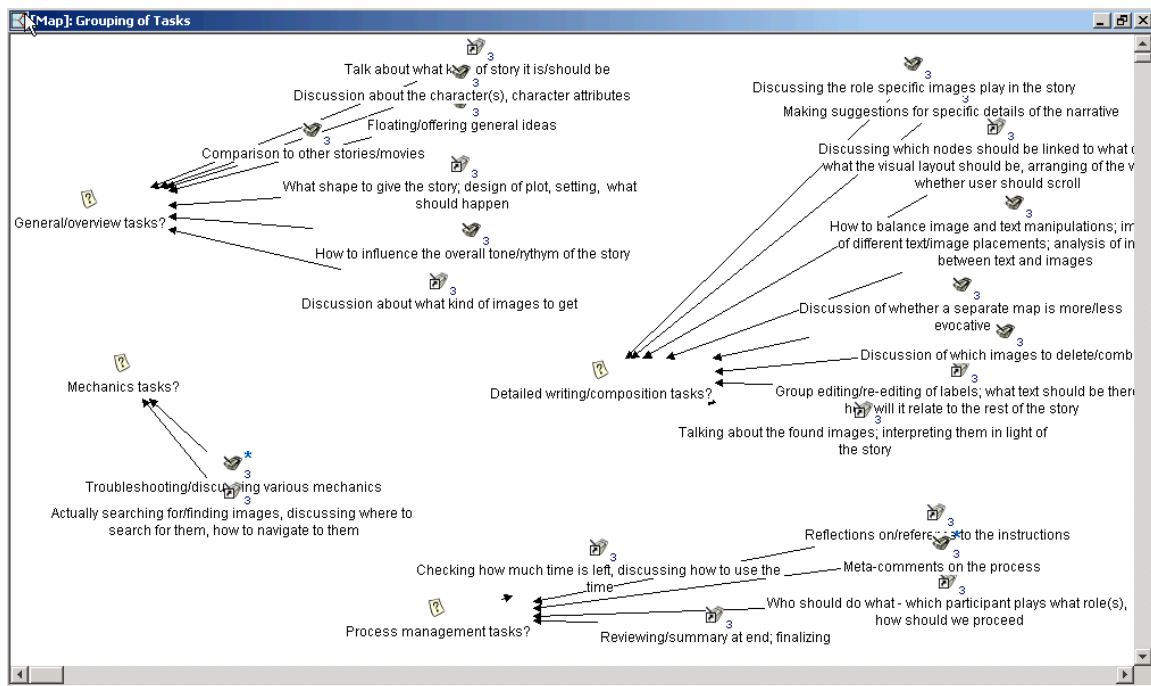
Figure 8: Thematic grouping of observational notes and participant debrief comments from experiment

All of the materials – the groups' stories, the video recordings, the notes and debrief comments, and the thematic groupings – were incorporated into the same Compendium database as my literature notes and other materials, available for later recall, review, and integration with subsequent work.

My main goals for this experiment were, first, to "shake out" any logistical or other issues in constructing a larger-scale such experiment (as described in the "Initial action research plan" section above. Second, I wanted to see whether Compendium could indeed "work" as a collaborative hypermedia fiction environment, and whether groups could engage with the medium as a storytelling device.

---

[11] The full set of notes captured in Compendium can be viewed online at
http://kmi.open.ac.uk/people/selvin/notes/10Feb2004DebriefNotes.html

While the approach seemed logistically workable and effective, and worth pursuing at some future point, my concerns about finding a suitable venue as well as positioning an action research approach were growing.

3.1.4 Summary of initial experiments

The experiments described in this section took place during the first four months of my doctoral work. They helped to surface a number of research questions, themes, issues, and risks that both clarified some of my early assumptions and ideas, and sharpened my focus on finding a direction for my actual thesis work that could be accomplished with sufficient focus, low logistical risk, and high analytical and theoretical return. The advent of the 2004 Mobile Agents field trial and my subsequent analytical work appear to have provided the basis for a research plan that meets these criteria. I will describe this analytical work in the next two sections.

3.2 Grounded theory analysis of an instance of PHC practice

3.2.1   Background and introduction

The 2004 Mars Society/NASA Mobile Agents field trial introduced a new strand of research on how best to support Remote Science Teams (RST), whose members, in actual space missions, are likely to be spread across the Earth in multiple time zones. The trial provided a testbed for new kinds of collaboration technology, to see how well these tools and methods can connect the RST with each other, and with a crew located on another planet. The problem was how to ensure that the RST could work with maximum efficiency and productivity and coherence in the extremely compressed timeframes they had to do their work. After each EVA, the hab crew would prepare its materials (along with the dozens or hundreds of image and other data files uploaded to Science Organizer). The RST had to examine and digest this material then formulate an analysis and recommendations in a coherent form all in the space of a two-hour teleconference held early in the morning. The job of the RST facilitators was to downlink the science data and hab crew analyses, prepare materials in a form that the RST could examine most rapidly, convene the teleconference and web conferences, facilitate the discussion while it unfolded to keep it focused and on track, capture questions, ideas and recommendations on the fly in a visual concept mapping tool, format the materials in best possible form, then uplink the materials for the hab crew as well as publish them on the web for other Earth-based teams. RST members and facilitators operated in a 'loosely coupled' mode, working as a virtual US-UK science team, from separate offices and homes, having never met in person, picking up tools and data from diverse emails and web links as well as specialized software. The facilitators had to work adeptly with the software tools in question while simultaneously playing conventional meeting facilitation roles and participating actively in the discussions.

The larger team of researchers of which I was a member came into the field test with a number of research questions, including: Can this role and these tools add value in an environment already well supported by other sorts of knowledge tools? If so, what kinds of value? How to characterize the value? What opportunities for further development of tools, methods, and human skills will enhance the value or remove impediments?

Lessons learned during this experience included new methods of preparing "portals" of web-based visual materials (generated from Compendium); the key role of human sense-making building on the substantial benefits from all the automation; and the ways that the RST and hab crew seemed to garner huge benefits from seeing the associations between ideas, images, and other data that their collaborators had made.

For my analysis, I chose an RST session conducted on 6 May 2004, which is described below.

3.2.2 Context and constraints

3.2.2.1   Contextual issues

Various themes of discussion occurred throughout the session I analyzed. These were recurring concerns for the RST participants:

- aspects of the geological methodology that one of the RST members had developed
- the need for the State University of New York at Buffalo RST to "get on the same page" as the "main" RST (the one that participated on the 6 May telecon), especially with regard to reviewing and using the methodology in their analyses
- what the RST would and wouldn't be able to accomplish within the two hours of the 6 May SOWG
- how the RST and crew should interact

Additionally, the participants and practitioner had the knowledge that the day's meeting in particular, and the Mobile Agents field trial in general, were part of an experiment in which the particular tools and techniques they were using were themselves a "text" for the meetings, as opposed to familiar, unquestioned background features of the landscape in which they operated.

3.2.2.2 Process constraints

Process constraints included the pre-existing agenda of particular tasks the participants wanted to accomplish in the course of the session. For the episodes considered in this analysis, this especially included the need to produce a science analysis useful to the crew in the time they have allotted for this purpose during the SOWG. There was no explicit amount of time, but the stated agenda called for two major previous activities (a methodology discussion and a review of the BuddySpace instant messaging tool), as well as the concluding activities of construction the summary map(s) and web exports, so the amount allotted for science analysis was constrained. In addition, the practitioner had to create the Portal map and web export prior to the meeting, as well as establish the Webex session and phone conference bridge. Even after the session started, he was still doing last-minute construction activities within the Compendium database to prepare particular maps for the day's meeting.

3.2.2.3 Organizational/group work constraints

Each RST member, as well as the practitioner, had incomplete knowledge and understanding of the agendas, capabilities and skills, prior discussions, and explicit duties of all the others. They had sufficient understanding to be able to enter the session and work efficiently together, but much time and energy was spent discussing or clarifying things that greater mutual knowledge and understanding – familiarity – would have obviated the need for.

3.2.2.4 Knowledge constraints

Each RST member individually had been able to do varying amounts of pre-consideration and analysis of the science and other incoming data, as well as to review the analyses

produced by the various RST members beforehand. Their ability to move fluidly through the current SOWG was constrained by how much of this work they'd been able to get done beforehand.

3.2.2.5 Subject matter constraints

Only particular data were available to the participants – only that contained in previous sessions and analyses as well as the current set of new data from the previous day's EVA. In particular, the participants were constrained by their limited knowledge of the physical area that the still_image_one_AstroOne_0_0_0.jpg image node was derived from. Shannon, the RST leader, had previously visited the area so was relatively well informed on the particulars of the various locations in the area (though was reluctant to "use" her knowledge of the area in the RST's deliberations, since they were supposed to pretend they were looking at data from a Martian region that no one had seen before). Neither Stacy nor Melissa (the other RST members on the telecon) had first-hand knowledge of the area except that which they'd gleaned from previous RST discussions and their own individual reviews and analyses of the materials generated from hab crew meetings (such as the hab crew lead, Maarten's, "hand-drawn map") and those generated by the various agents for review in Science Organizer or Compendium (the RST members had looked at many of the materials as they streamed in one by one over "CapCom" email).

3.2.2.6 Resource constraints

The RST had unanticipated (in their particulars), but inevitable problems with the various tools (since many of the technologies were new, either for all the participants, such as Compendium, or for some, such as Webex). In this session, for example, Stacy was not able to connect to Webex so did not see what the others were seeing for the most part, and there had been previous problems with Compendium downloads/imports.

3.2.2.7 Practitioner's framing concerns

These were concerns that can be said to frame the practitioner's actions in the 6 May SOWG session:

- operating the Compendium and other tools effectively in the moment (keeping up, not falling behind, capturing comprehensively, etc.)
- seeing what the other tools have done
- thinking about what the tools could do, in future evolutions
- helping the RST to accomplish their goals, both those stated for the session and those that spontaneously arise during the course of the session
- crafting the Compendium representation's textual, visual, and knowledge aspects so as to provide the best communication and products for downstream consumers (the hab crew and others)

3.2.2.8 Practitioner roles

The primary roles of the practitioner in this effort were to gather, prepare, and publish materials before RST meetings; arrange the phone and web conferences; convene the sessions; assist in locating and analyzing science data; capture discussion and decisions during the sessions; assist the RST with software and tool issues, build and modify the

Compendium hypermedia representation on the fly; retrieve materials from other tools and repositories and integrate them into the representation; create summary materials at the conclusion of each session; and publish the materials to the web and other repositories (such as the Science Organizer semantic database). Doing this work required a variety of types of expertise, including listening and interpreting; intervening in the participants' 'normal' conversation flow when necessary; getting validation for captured material; building hypertext representations on the fly; interrelating data and objects; adding metadata; and other skills specific to the particular software packages in use.

3.2.3 Analysis method

The analysis reported here was my first attempt to apply grounded theory (Corbin & Strauss, 1981) to the understanding of situated expertise in participatory hypermedia construction. I had not been present at the 6 May session, so I felt I could analyze the data with a degree of objectivity. I first reviewed a screen capture video and audio recording of the session, transcribing all participant statements, practitioner actions, and practitioner statements. I then catalogued all "moves" made to and on the Compendium representation itself (646 in the session discussed here), and built up a set of explanatory concepts, categories, and properties, focusing on the engagement of both practitioner and participants with the Compendium representation. This was then validated with the observed practitioner (Simon Buckingham Shum) as well (partially) with the participants.[12]

3.2.4 Emerging principles and coding categories

The episode contains a number of moves embodying some of the considerations outlined earlier in this report. The RST's realization that critical information was missing from the imported science data created a "dilemmatic moment," which spawned sensemaking behaviors for both the practitioner and the participants. 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.

My analysis attempted to gain a situated understanding of each move within each event, episode, and session, with special attention to the improvisatory, communicative, aesthetic, and other dimensions discussed earlier. To do this, I examined each move in its context, looking at each aspect in Table 1, which also provides some summary data about the 6 May session. The specific aspects were built up through transcript and video analysis, following the grounded theory approached mentioned earlier.

---

[12] The complete annotated transcript, along with the screen recording, audio clip, taxonomy of practitioner moves, and other support materials, can be found at stadium.open.ac.uk/stadia/preview.php?s=29&whichevent=494.

Table 1. Move-by-move analysis schema

Aspect	Description
Time: Start and End	Chronological (*mm/ss*).
Participant Verbal Statements	Transcript of any participant utterance made in the course of a move.
Participant Engagement with Representation	Characterizes the degree to which participants are paying attention to the hypermedia representation during the move. Possible values: Active, Direct, Delinked, Partial, Unclear. "Active," which refers to moments when participants are directing the practitioner to perform particular actions on the representation, has sub-types of Text, Validation, Navigation, and Structure.
Practitioner Verbal Statements	Transcript of any practitioner utterance made in the course of a move.
Move Type	Assignment of each practitioner move to a value in a taxonomy of Compendium moves, which currently contains 50 principal types and 44 subtypes, e.g. Node Move-Arranging, Navigate-Map Open, etc.), or Verbal move types (Statement/Announcement, Acknowledgement, Query, Helpful Comment, Exclamation).
Activity Type / Stance	Characterizes the main orientation and purpose of the practitioner's actions during that move. Five principal stances were identified in the 6 May session: Navigator, Facilitator, Participant, Editor, and Technical Expert. The taxonomy of activity types currently contains 13 main types and 9 sub-types. E.g., Creating-Capturing & Refining, Searching-At Participant Direction, etc.
Is Move Part of a "Compound Move" or "Mini-Project"?	Assigns move to a group of moves done as part of a single purpose, if applicable. E.g., there were 15 mini-projects in the 6 May session, ranging from 4 to 63 individual moves.
Practitioner Response / Engagement Mode	Characterizes the degree to which the practitioner is engaged with the participants during the move. Possible values and their proportions of the total in the 6 May session: Direct (209), Semi-Direct (49), Indirect (221), Delinked (290). Delinked refers to moves when the practitioner's attention is focused completely on his manipulation of the representation and he is not interacting or responding to the participants. See Figure 10.
Practitioner Focus	Characterizes what the participant is paying attention to and/or working with during the move. Can be (and often is) multiple. Values: Participants, Maps, Text, Subject Matter, Surroundings, Process. See Figure 9.
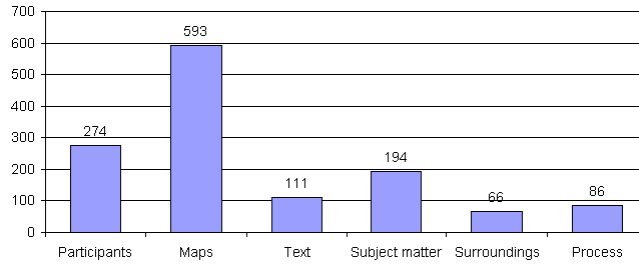
Figure 9: Distribution of practitioner focus during 6 May session (moves can have more than one focus)
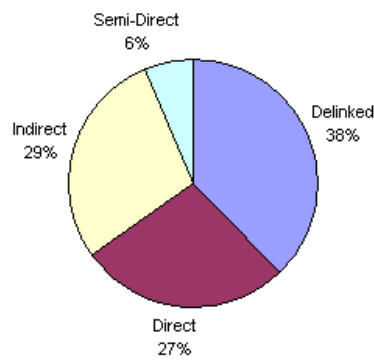
Figure 10: Modes of practitioner engagement with participants during 6 May session as proportion of total moves

3.3 Critical incident analysis of an instance of PHC practice

3.3.1 Introduction

This section describes my initial attempt at a close analysis of practitioner skills, ethics, and aesthetics in the course of creating and modifying a collaborative hypermedia representation during a real-time interactive session with participants.

The analysis looks at three brief episodes in the 6 May 2004 Remote Science Team (RST) Compendium web conference, facilitated by Simon Buckingham Shum, with participants Shannon Rupert, Stacy Sklar, and Melissa Farley. The session lasted 135 minutes. Participants met over a phone teleconference held simultaneously with a web conference, using Webex technology to view the practitioner's computer display. All four people were in different physical locations, in California, Arizona, New York, and the United Kingdom.

The three episodes chosen for this analysis follow the "life" of a few hypertext nodes created in response to a problem with an image node imported into the Compendium database from the Mobile Agents field trial EVA held a day earlier. The episodes are connected because each featured the creation and modification of nodes and links having to do with the RST's and facilitator's response to the image (a photograph taken from the Boudreaux robotic rover in the Utah desert).

3.3.1.1 Analysis method

My analysis separates the segments into discreet events to make the discussion more focused and comprehensible (rather than attempting to talk about each segment as a whole). The starting and ending points for each event are somewhat arbitrary (as are those for the segments as a whole), but are based on observable demarcations of intention, action, and/or context, some shift or change in the direction or intent of the practitioner's actions

For each event, I provide a description of what happens during the event, followed by short characterizations of practitioner focus, practitioner knowledge, practitioner/participant communication, notes on tool and artifact use, practitioner skills and expertise demonstrated, and comments on any aesthetic considerations from the event. Finally I discuss any ethical implications of practitioner choices made during the event. Ethical choices are those that affect people both at the time of the action/choice and later.

The discussion particularly of aesthetics and ethics is sketchy and tentative, as this is a first attempt to characterize practitioner actions in this way, and may or may not be occurring at the proper level of granularity. At this early stage I will not make judgments about the "quality" of the aesthetic and ethical choices that the practitioner makes; later theoretical analysis will possibly expand on this, if I develop criteria by which such judgments can be made.
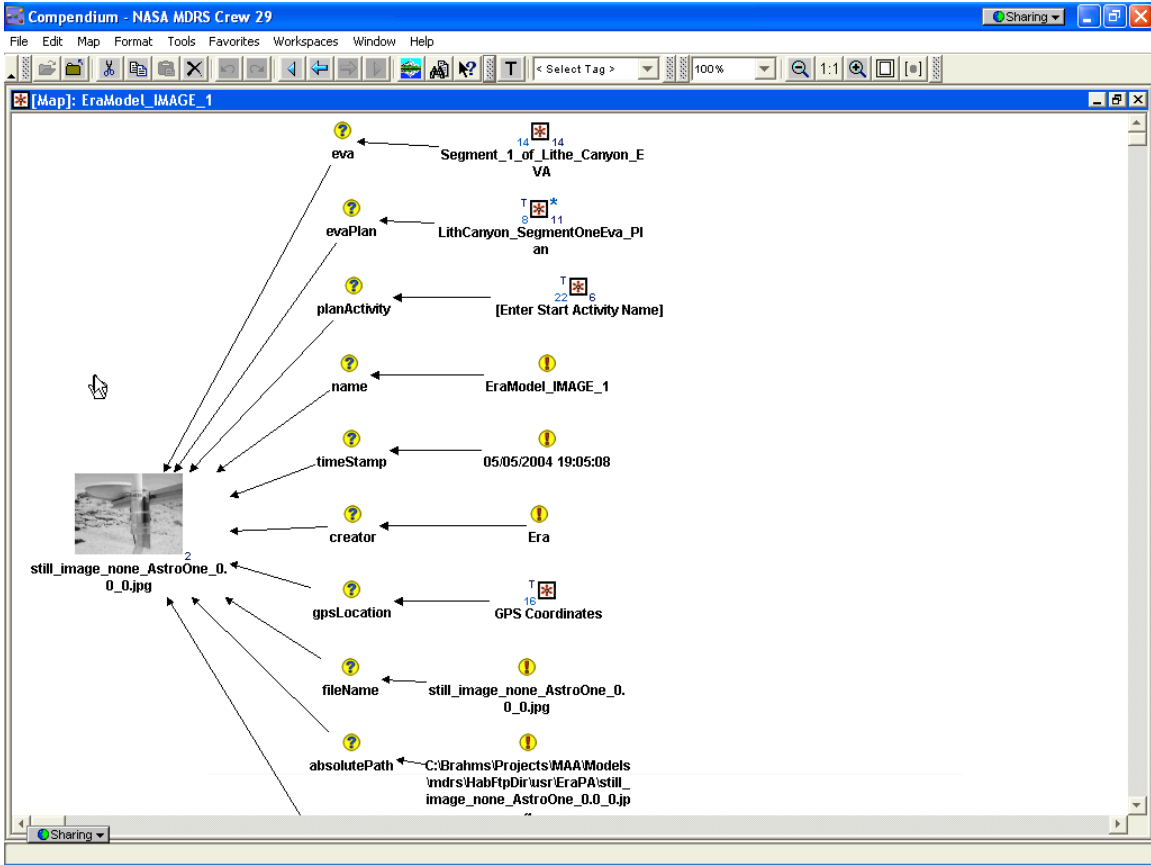
Figure 11: Agent-generated EraModel_IMAGE_1 map

3.3.2 Overview of the three episodes

This is a graphical overview of the life of the nodes, beginning with the genesis of the image node.

A1. Astronauts in the field on 5 May 2004 instruct Boudreaux to take the photo

A2. Software agents capture the image over a wireless link and send it to the Science Organizer web database and the Compendium database in the 'hab'. The Compendium agent also gives image the label of "still_image_none_AstroOne_0.0_0.jpg" and embeds it in a map titled "EraModel_IMAGE_1", with additional nodes linked to it as shown in Figure 1 (the map itself is embedded in other generated maps) The database is sent via a satellite link to an ftp location for downloading

A3. Before the RST session on 6 May, S. downloads the database and image files and imports them into the Compendium instance on his computer

A4. The RST comes across the image and map in the course of beginning to analyze the science data from the 5 May EVA

A5. The RST can't determine the physical location that the image shows, giving rise to the "Finding Waypoints" episode 60:37-63:29. A new node is created and linked to the image node

A6. Later in the session, the image and associated nodes are discovered again in the course of creating the final summary map. The new node from earlier is tagged, copied, and pasted and relinked in the summary map. This is the "Revisiting Finding Waypoints" episode 119:43-121:25

A7. Still later, during the final arrangement of the summary map, S. has further insights about the nodes and creates another node containing these. In the course of this, the nodes are moved to the top of the map, linked, and tagged. This is the "Final Annotation "episode 132:15-134:18

The analysis that follows focuses on steps A4 through A7.

3.3.3 Event analysis: Finding Waypoints episode

I named the first segment to analyze "Finding Waypoints." It concerns a disruptive event in the flow of the 6 May RST session, when both the RST participants and the practitioner realize that crucial location (waypoint) data is apparently missing from the imported science data.

Flow of events in the Finding Waypoints episode

FW1. Trigger: Recognition that data (which waypoint?) is missing (60:37-60:50)

FW2. Looking for the missing data (60:50-60:58)

FW3. Diagnosing cause, making guess (60:58-61:24)

FW4. Putting in the guess (practitioner)

FW5. Continuing diagnosis and discussion (participants)

FW6. Augmenting the guess with diagnosis

FW7. Augmenting the guess with the image node's filename

End

Figure 13 summarizes key moments in the episode described above. It shows the trajectory from sensemaking trigger through improvised investigation, consideration of alternatives, construction and aesthetic refinement, culminating in direct verbal engagement between participants and practitioner and further refinement.

Figure 13: Timeline of Finding Waypoints episode

3.3.3.1 Event FW1: (Trigger) Recognition that waypoint data is missing (60:37-60:50)

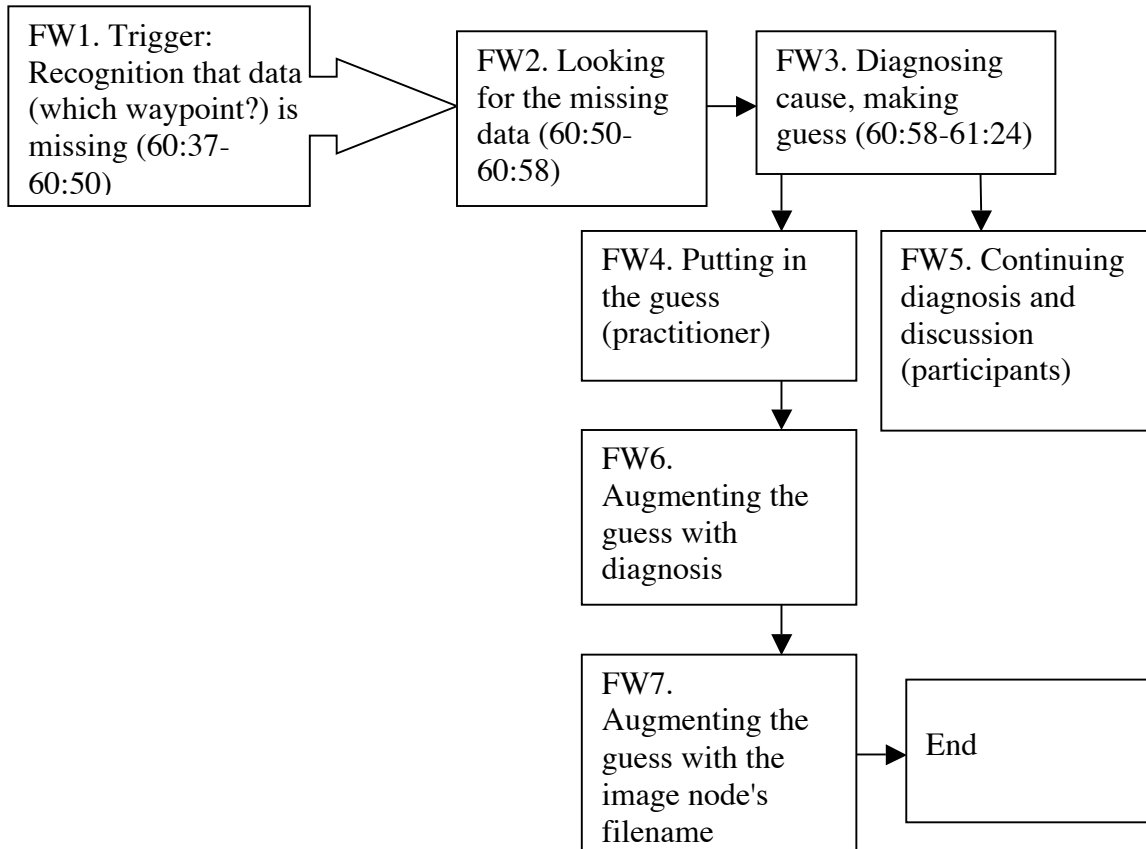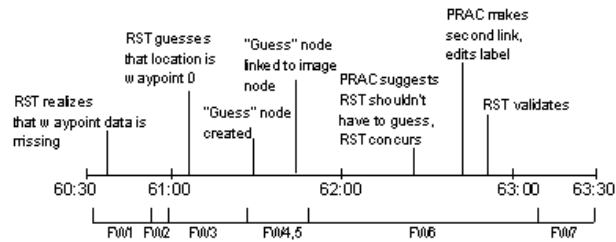*Description.* In the midst of the 6 May session, after completing a review of the BuddySpace tool for possible use by the RST in subsequent sessions, the team turned to the third item on their stated agenda for the meeting, "3. Analysis of data downloaded from Wednesday's EVA." Prior to the start of FW1 at 60:37, Simon had navigated to the map titled "Segment_1_of_Lithe_Canyon_EVA May 5_2004 6:57PM_BST Science Data" where the RST observed Brahms-generated nodes indicating that AstroOne had done something at Waypoint4, and AstroTwo had done something at Waypoint2. That map also contained two map nodes for EraModel_IMAGE_1 and for EraModel_IMAGE_2. As Simon navigated through the maps, Shannon and Stacy discussed whether Stacy had had time to map the Waypoints on the aerial map. During this time, Simon is working in a combination of Direct engagement modes (doing navigation moves at the direct behest of the participants), and Indirect engagement (making small independent moves to refine what the display is showing).

At this moment, the RST and Simon are anticipating different activities in response to the science data nodes they're about to look at. The RST is expecting to look at the nodes, analyze them, talk about them, perhaps with reference to the analyses that various members had already done the previous night. Simon was poised to capture the analysis discussion and steward the visual representation. But the event that occurs shifts both parties out of that poised anticipation into a different kind of exploration and problem-solving mode, questing for key information missing from the imported science data nodes.

At 60:33, Simon had the EraModel_IMAGE_1 map open for review by the RST (see Figure 14: Screen at 60:37), hovering the cursor over the image node so that the image displayed large on the screen. The image is a monochrome image taken from the Boudreaux rover's still camera. At 60:37 Shannon comments:

> "And this is at Waypoint … what Waypoint is this, 2?" [inaudible response in b/g]
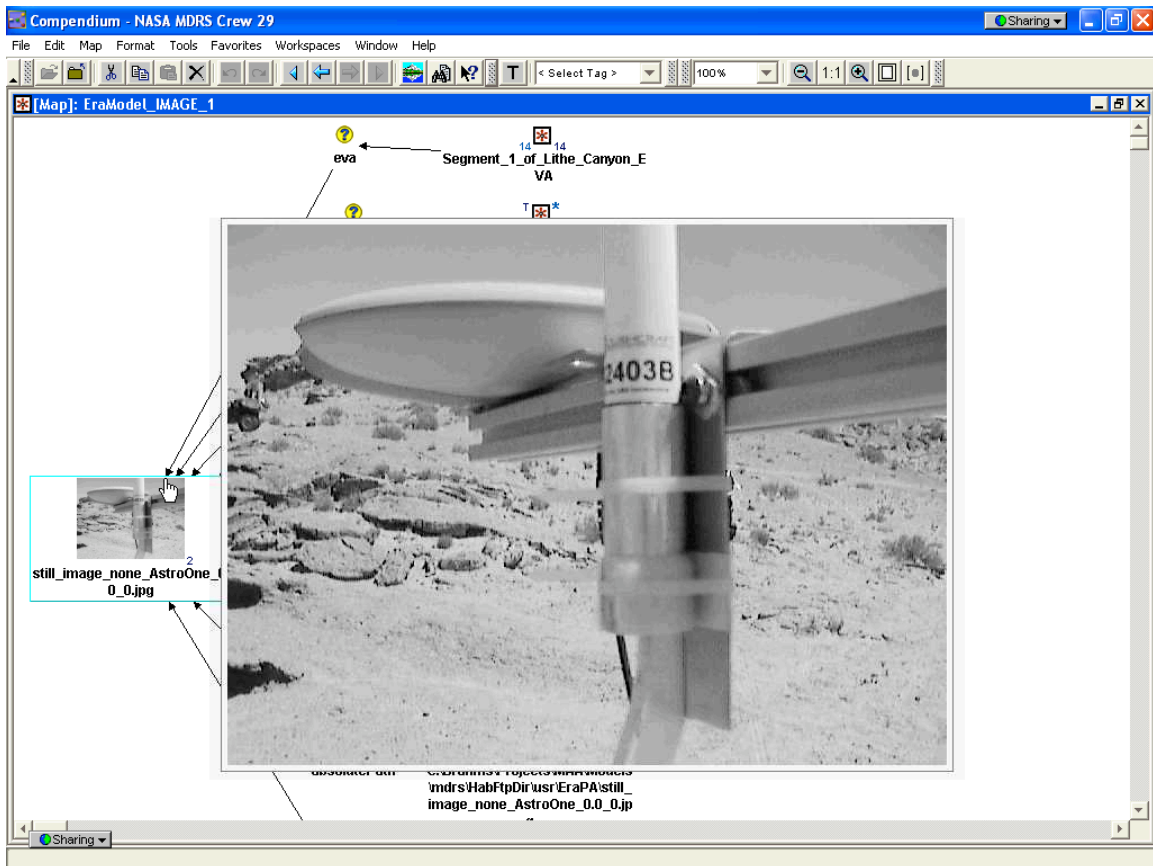
Figure 14: Screen at 60:37

This is the trigger for the segment to analyze. At this moment Shannon is not able to continue moving forward with the analysis. Waypoint information is necessary to be sure of the physical location that the image refers to, especially in order to be able to locate it on other artifacts such as the "hand-drawn map" created by the hab crew that shows the relationship of waypoints to geographic/physical features. The participants experience the lack of waypoint information as a surprise, violating the unspoken assumption that as they penetrated deeper into the downloaded science data they would always be able to cross-reference each level of the data effectively (indeed this assumption was based on the care that had been taken to provide multiple kinds of information on each science data map, such as 'creator', 'gpslocation', 'timestamp' etc. that can be seen in Figure 14).

Simultaneously Simon realizes that something is wrong that requires interrogation. He responds with a ruminative exclamation:

> "Umm…"

which acts as a sort of placeholder indicating that something has occurred that will cause him to lift out of the navigation/displaying engagement mode he had been in for the previous few minutes (but he does not yet know what will come next). In the previous segment he had been moving fluidly through maps in response to Shannon's stated

wishes to show the participants particular information from the EVA. At Shannon's question here he is taken out of that mode and shifts immediately into a searching/sensemaking mode, where it is not clear what he needs to do to solve, or even characterize, the problem that is presenting. The first action he takes is to look for the missing Waypoint data (FW2).

3.3.3.2 Event FW2: Looking for the missing data (60:50-60:58)
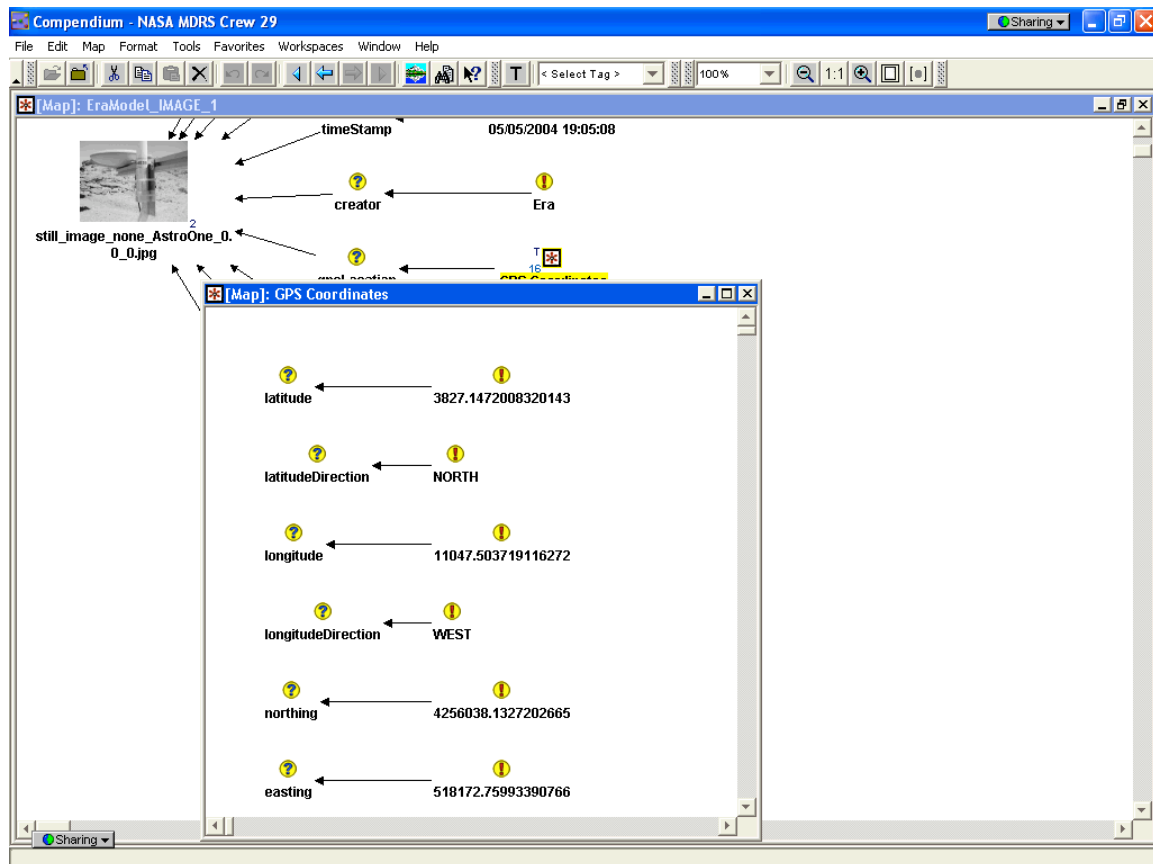
Figure 15: Screen at 60:55

Description. The responses of the participants and the practitioner diverge after the triggering event (FW1). At 60:50 Shannon says "I'll look it up," an apparent reference to consulting Science Organizer, emails, or other sources to figure out the missing data, followed a few seconds later by Stacy saying "Wait…" and Shannon continuing "I actually ... Have to go back." Simon, instead, starts looking around in Compendium for the apparently missing data (he could have sat back and waited for Shannon to return with the information, but instead takes the initiative to begin investigating on his own).

His first action (at 60:51) is to scroll down the EraModel_IMAGE_1 map to see (apparently) if the data could be lurking down there. He seems to cast over the map (moving the cursor over various nodes) and not see anything helpful, so at 60:54 he hovers over, then selects, then opens the "GPS Coordinates" map node, apparently to see

if that map contains anything useful. After 3 seconds of glancing at that map (probably considering whether anything of what it shows could be useful), he closes it, then navigates (using the Map Back button) back to the containing maps two levels above (Segment_1_of_Lithe_Canyon_EVA May 5_2004 6:57PM_BST Science Data) at 60:58, concluding the event (he was unable to find anything useful in his initial effort).

Focus. In this event, Simon's focus is on the maps, looking for the missing information. He is indirectly engaged with the participants, not directly taking part in their conversation, though aware of it.

Knowledge. Simon's choice of actions here reflect an understanding of what sort of information a map might contain based on the text in its label ("GPS Coordinates") and the relation to the subject of immediate concern (in this case, postulating that the missing location (waypoint) data might be found in a map containing geographical position data). He spontaneously launches a "plan" to review the existing map, locate a potential source of further information (the GPS Coordinates map), open and inspect its contents, then return back "up" to a higher level to continue the search. He also demonstrates a consideration that some of the maps that are included inside the various maps he looks at during the event would *not* contain the kind of information he is looking for, thus opening them would be a waste of time. He maintains a sense of 'presence' and 'location' – where does he need to be at the present moment, both to solve the current problem and to keep within the bounds of an understandable context for the participants (i.e. where to be in *relation* to what else is going on), and where will he need to be in order to stay a move or two ahead.

Communication. The communication in this event is mostly between the participants themselves. Simon does not verbally interact with the participants except for his "Umm…" interjection. They don't take direction from each other, each acting for the moment on their own.

Tool/Artifact Use. It is interesting that the reactions of participants differ from that of practitioner here. The participants' (at least Shannon) first reaction is to think of looking in other artifacts ("go back") for the waypoints information. Simon on the other hand looks elsewhere in Compendium. This may be because the participants experience the various information artifacts in the overall experiment (Science Organizer, CapCom emails, Compendium, intra-RST emails and documents such as the PowerPoint analyses) as more of a continuum, without privileging one over the other, than Simon does; his focus is on Compendium and working with the data as it is present in the database. He is concerned with the performance of the tools and the intricacies of their representations and interrelationships, particularly the way the Brahms-generated science data is represented in Compendium (since he was in on the design, or at least planning, of that). He is always aware of what they designed into the imports and exports so is confounded that something is missing that ought to be there – a connection wasn't made.

Skills/Expertise. The navigation and display moves he makes are very fast. He knows where to look and how to accomplish the moves he needs to make.

Aesthetics. The primary practitioner activity in this event is exploring the existing data for missing information. There is no "making," hence no aesthetic judgments or actions to comment on.

Ethics. Simon's stance during this event is essentially that of a participant, albeit one with particular capabilities. Since the advent of the missing information is as discontinuous to him as to the RST members, he plunges into the same kind of sensemaking speculation and exploration as they engage in. He can't continue in a "facilitator" stance and shifts into a problem-solving mode. This reflects a "we're-in-this-together" orientation that occurs on several levels – helping to solve (and being as implicated by) the immediate problem, as well as demonstrating a responsibility to "fix" the larger set of mechanisms that led to the situation of the missing data in the first place – that is, Simon had been part of the design team that had come up with the mechanism for generating the science data as Compendium nodes according to a particular template, so his problem-solving here is directed equally at trying to understand how such a situation could have come about in the first place.

3.3.3.3 Event FW3: Diagnosing cause, making guess (60:58-61:24)
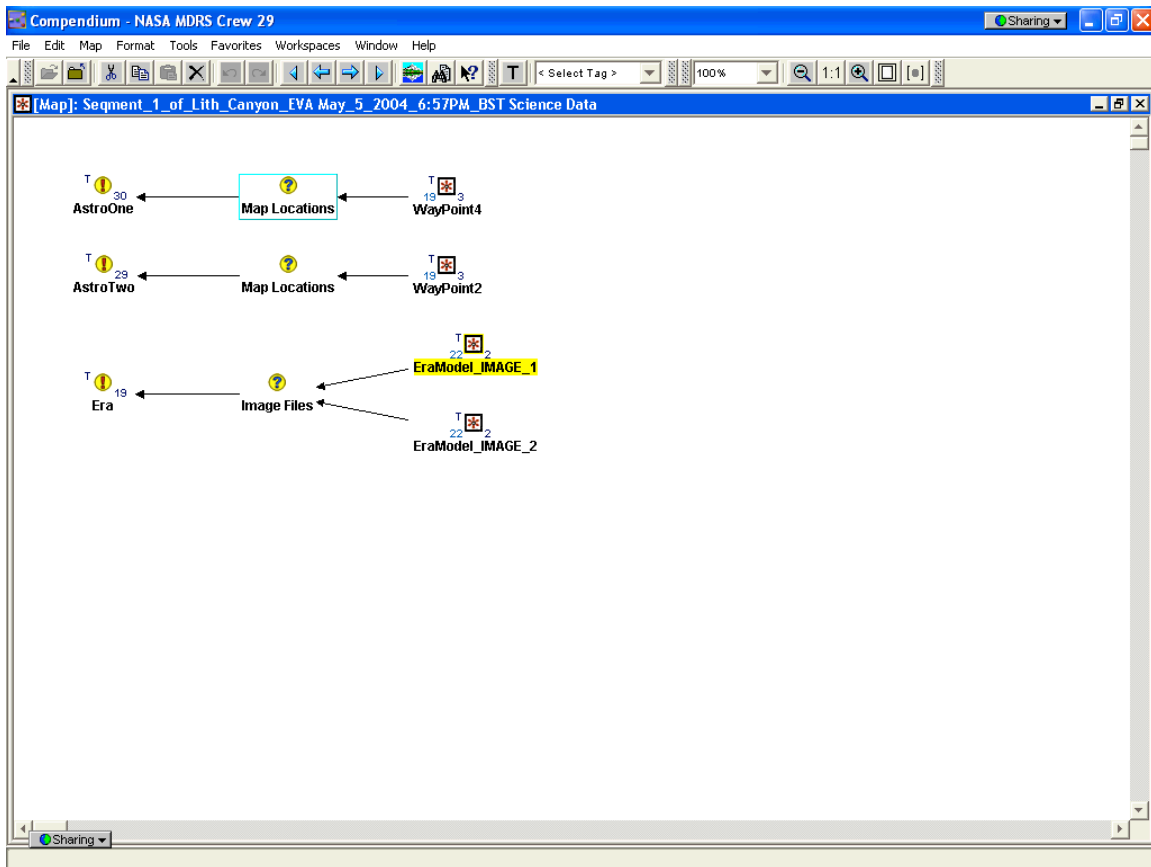

Figure 16: Screen at 61:02

Description. In this event, the participants and practitioner partially come together again, considering what they've just seen and trying to determine a way forward. At 60:58, Simon says in a musing tone,

> "Do we not know what Waypoint, why do we not know…"

At the same time that he has been exploring the maps in the previous event, he is also aware of the conversation between the RST members, as if there is a "channel" open listening for key input even as he is mostly engaged in his own investigation. He is both manipulating Compendium and partially listening to/engaging in the group conversation. At 61:01, Shannon says

> " "o wait wait wait " "I'm assuming that one of these [clears throat] excuse me [again] is taken at Waypoint, no! cause that's the ERA"

During this statement Simon moves the cursor around the map, as if going over the contents looking for something of value, using the visual feedback to help bring forth any ideas from the node collection. At 61:12 Simon highlights the map node "Waypoint 4", but then moves the cursor and hovers over "Astro One" (musing "Astro One…" at 61:10).

At 61:12, Shannon makes what amounts to a guess about the Waypoint location of the image node:

> "Yeah so it's taken at, they're taken from, I'm assuming, Waypoint 0" "that's zero" "Yeah" [chorus from other RST members]

Followed by Stacy supplying some subject matter evidence (that Simon does not capture):

> "Because that [?] the, on the East side of the talus slopes hill is the canyon mouth."

Simon appears to take this in and make a decision that it is time to shift from deliberation/exploration to another mode. He prepares to make the next move by moving the cursor to then opening ERAModel_IMAGE_1 map at 61:24, ending this event.

Focus. Throughout this event Simon's focus is on the maps and the subject matter, with a "side" channel of attention to the surrounding discussion.

Knowledge. Simon demonstrates knowledge of how to determine what is salient (and what can be let pass) in the RST members' discussion.

Communication. The direct verbal communication in this event is between the RST members talking through different interpretations of the image. However Simon is actively listening to the discussion, effectively dividing his attention between his continuing exploration of the maps and the surrounding discussion. His verbal comments

are more or less unheard by the RST, but they constitute an active participation in the discussion nonetheless. They can be characterized as tentative, exploratory comments.

Tool/Artifact Use. This event did not display much significant tool use.

Expertise. There is an expertise of being able to operate the tool while simultaneously listening with discrimination to the discussion on the phone; both pursuing his own cognitive track (evidenced by continuing to move the cursor around the map) while interpreting the significance of the discussion (highly contextual) as he goes.

Aesthetics. Nothing much of aesthetic interest in this event except the implied "displaying" of his thought process by moving the cursor around.

Ethics. In this event Simon makes a choice to cease his semi-autonomous exploration of the maps and capture what he hears of the participants' characterization of the missing data. To understand why this is a choice, reflect that he could have either a) kept looking around on his own, b) stopped the meeting and looked in other information sources, such as Science Organizer (a choice he makes later on in the meeting for another purpose), c) done nothing and let the RST members continue to discuss and explore, waiting for their determination, or other possible actions. His choice possibly also reflects a judgment that it would not be fruitful for the current meeting to continue spending time on this point.

3.3.3.4 Event FW4: Putting in the guess (practitioner) (61:27-61:46)
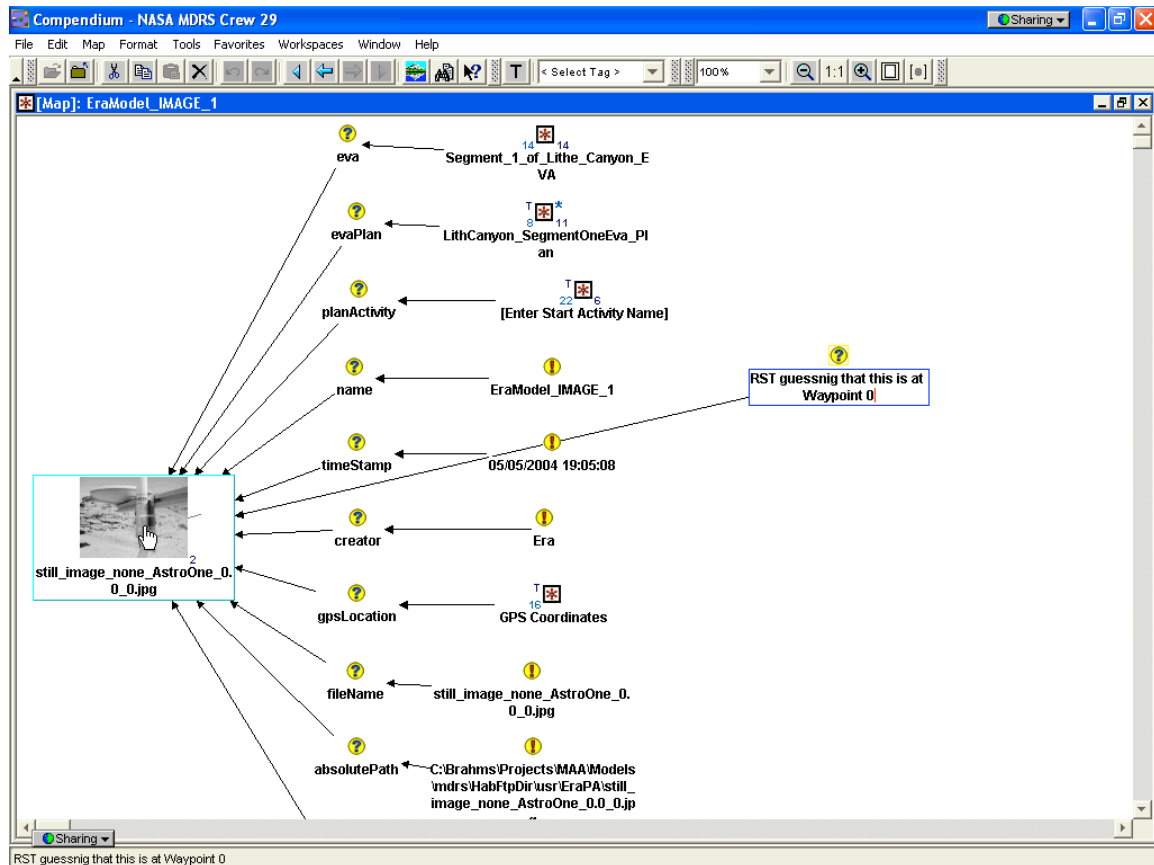
Figure 17: Screen at 61:41

Description. In this event Simon creates a Question node capturing the preceding few seconds' deliberation from the RST members. The node creation is unprompted and impromptu, not directed from the RST, and not in response to any particular coda in the conversation. Rather, Simon seems to have determined that the RST would not be able to get any closer or more information to inform the Waypoint determination than what they had just said. The issue is rapidly dealt with and 'capped' at least for now.

The event proceeds in four distinct moves. Since the last position of the window had been at the bottom of the node area of the map, first Simon scrolls to the top of the map window in preparation to create the node. At this moment (and even before, at the closing move of FW3 when he reopened the map) he must already have the node creation act in mind; that is, the moves he is now making are with the goal of creating the node whose text, at least in some form, is already in his mind. Next, at 61:29 he creates a Question node and gives it the Label "RST guessnig [*sic*] that this is at Waypoint 0", completing the text entry at 61:38. He chooses an area in the white space to the right of the imported science data nodes, implying, or emphasizing, by this choice that the new node is a comment on the science data rather than an addition to it; it is "outside" of the pre-existing imported science data. His choice of a Question node is an interesting one given

that the text of the label does not actually embody a question (that is it does not ask a question); instead it implies a "questioning" of the science data itself, or an expression of doubt or uncertainty ('there is something questionable about this' or 'we didn't really know what to say exactly'). The comments he makes in the label implies "we couldn't make as much sense of this image as we would like," which serves both as a comment back to the Hab crew as well as a note for later consideration of the process as a whole.

Next at 61:39 he draws a link from the new node to the image node, emphasizing that the Question is in reference to the image node itself. Finally at 61:46 he clicks in the Label of the "RST guessnig…" node and corrects the text to "guessing".

Simon's actions in this event are a shift from the exploratory/problem-solving mode he'd been in during FW2-FW3 to a node-making mode – he's both capturing and characterizing the moment. He uses a gerund – "guessing" – to characterize the event that has just happened and is still happening, as if to make a process note that, while characterizing this particular datum (the image node, or more precisely the Waypoint aspect that it is meant to refer to) also characterizes the data collection/communication/representation process itself (that is, that the RST had to make a guess as to the Waypoint location, which they shouldn't have had to if the science data process had worked as expected).

Focus. Simon's focus during this event shifts from a semi-direct focus on what the participants are saying to create a new node in the map (including the guess they are making in his node) to an indirect focus on making links and corrections in the map itself without engagement with the participants.

Knowledge. Several types of knowledge are evidenced in this event. Simon displays knowledge about node placement in maps (where in the map is the best place for the kind of node he's adding, as well as for the link he's going to draw). He displays a kind of planning knowledge, as his early moves are all made in the context of what he's going to do a couple of moves ahead. He shows semantic node typing knowledge (knowledge of what node type to use in this sort of situation (Question)). He shows knowledge of how and where to draw links, which would be the most effective node to link the Question to. Finally his choice of text for the node's label reflects knowledge of the context and framing concern for the meeting, that observations on the process are as important as fulfilling the ostensible analysis tasks themselves.

Communication. The participant/practitioner communication in this event is indirect. Simon does not verbally draw the RST's attention to the node he is creating or otherwise engage in the conversation, which continues between the RST members while he is performing the node creation. In fact the RST's conversation in this event is transitioning to a new theme; Shannon's comment at 61:44 is a prelude to a discussion of whether her prior knowledge of the physical location is acceptable information to include in the science data analysis.

Tool/Artifact Use. The kind of node created – a comment on both the immediate event and the data collection/publication process – adds a particular rhetorical use of the medium than most of the nodes created during the 6 May RST session. It is similar to an earlier node ("Stacy searching Science Organizer"), constituting a reflection on the process itself, a sort of standing outside the action and commenting on it, rather than a contribution to the ostensible corpus of RST analysis itself. Note that he does not Tag the node at this time.

Skills/Expertise. No expertise of note demonstrated in this event.

Aesthetics. As noted above, Simon makes several aesthetic choices during this event. He chooses to set the new 'comment' node in white space to the right of the rest of the nodes in the map, emphasizing its separateness from them and the nature of the comment it's making. He also chooses to link the node to the main image node, drawing the link across all the other nodes in the view, which serves to make it more dramatic, and possibly effective, emphasizing the disruptive quality of the missing information and the effect it had on the RST. He makes a textual aesthetic choice in his use of the gerund "guessing" to imply the unfolding, transitive nature of the comment in the node. If he had used the past tense ("RST guessed") it would not have conveyed the same 'process' sense of the moment.

Ethics. Simon had already made the choice to return to this view and make the node at the conclusion of FW3, so the ethics of that choice are captured in that discussion above. Here, the ethical choice is related to the text he chooses to use to characterize the event. As noted above he uses a gerund to emphasize the "process" nature of the comment that the node is making, and also that it would benefit the larger goals of the project to capture the fact that the RST had to make a guess. An alternative choice would have been simply to state "Waypoint 0" without the observation that this was a guess, with its implied provisionality. He chooses to highlight that fact that this was indeed a guess. He could have gone farther and made a meta-comment, similar to the verbal comment he makes about "why do we not know" that this information should have been in the imported science data, but he chooses not to do that at this time. By making this type of entry, he chooses to communicate information of this type both to the Hab crew (as part of the day's communication from the RST back to the crew) and to the larger context of evaluation of the technical methods and procedures used in this Mobile Agents experiment.

3.3.3.5 Event FW5: Continuing diagnosis and discussion (participants)

Description. This event is really the continuation of the discussion that continues between the RST members while Simon is engaged with the actions in event FW4. It is separated only for possible analytical clarity, since it occurs at the same time as FW4.

At 61:44, in a continuation of the intra-RST discussion, Shannon says

> "Well it's not what I would've … huh… never mind." [laughing]

This comment is not in reference to Simon's actions or the new node, and he does not (yet) verbally draw attention to the node he's created. The conversation between RST members goes on without him.

3.3.3.6 Event FW6: Augmenting guess node with diagnosis (61:45-63:12)
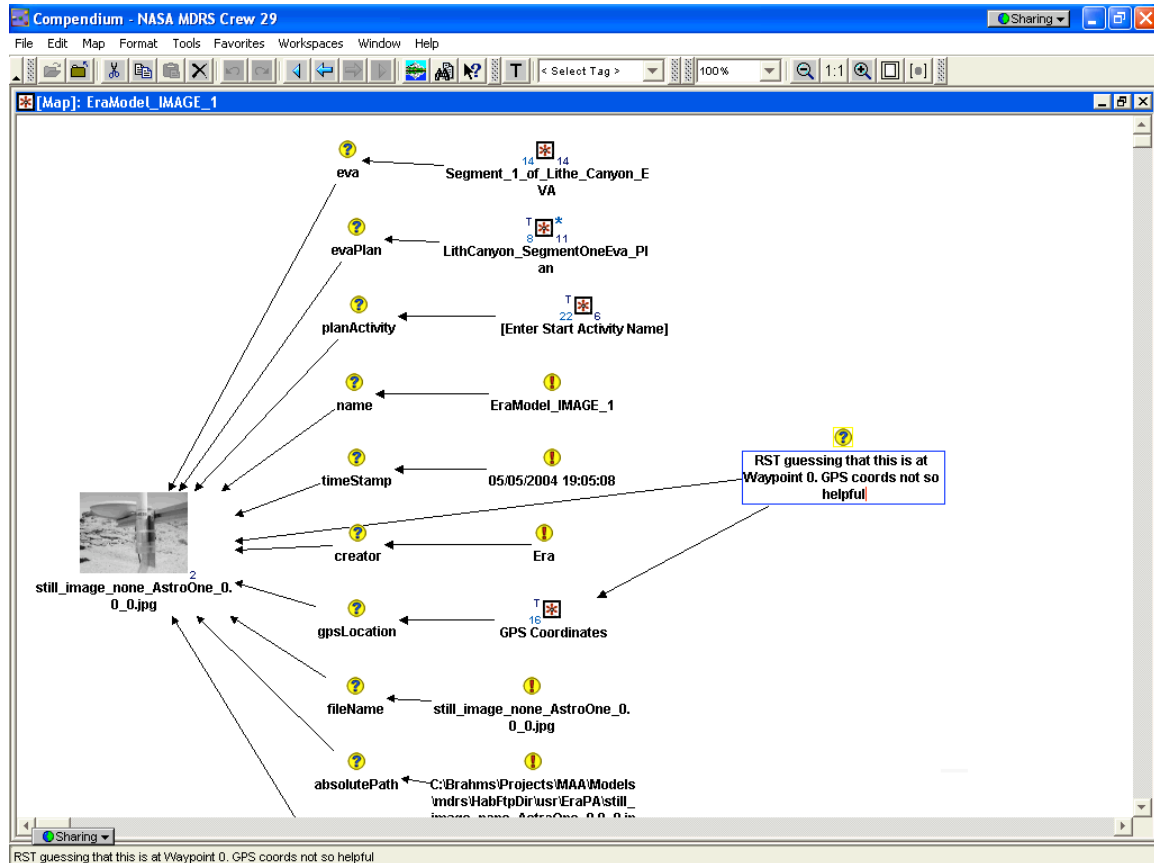
Figure 18: Screen at 63:10

Description. This event contains the first direct interaction between Simon as practitioner with the RST participants of the Finding Waypoints episode, concerning the point that Simon captured in FW4. In the first moments of the event, Simon takes no actions while he waits for the discussion started in FW5 to conclude, or at least waits for an opening where he can draw the RST's attention to the "RST guessing" idea. From 61:45 to 61:49, Shannon continues her thought from FW5:

"I'm trying not to use my higher knowledge of the area"

When she finishes speaking, Simon attempts to interject his thought (at 61:50):

"There shouldn't…"

but Stacy, apparently not hearing him, responds jokingly to Shannon's comment, followed by another statement from Shannon (61:51-61:57):

> "bad, Baaaad Shannon…" "I know it's hard, it's really hard, y'know"

Simon apparently decides to wait until the conversation on this point concludes, so he returns to making minor adjustments to the display, moving the node created in FW4 down a bit from 61:52 through 61:55 (not clear why this is done). He then waits, with the node still highlighted, taking no action while the below conversation between Shannon and Stacy continues until 62:25:

> "And then I of course had access to the scenario that I didn't know you guys had, didn't have access to, so even when they were reviewing the plan, in the hab, it was like all old news. So I was glad that you guys were y'know like you both said it was very cool how the way they did that cause for me it was just like OK this is a review " [laughing] "We're like Wow! that's cool!" "Yeah" [laughing] "So..."

At 62:27 Simon gets his thought out, saying

> " [inaudible] 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 points he is concerned with, particularly the way the data has been brought into Compendium. Shannon and Stacy 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..." "I don't know" "I'll shut up now."

In response to these statements, Simon launches another compound action to refine the "RST guessing…" node he had made in FW4 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 Shannon's comment above, to the end of the label (which now reads "RST guessing that this is at Waypoint 0. GPS coords not so helpful").

At 62:52 Shannon responds to this, including a direct response to Simon's paraphrase of his words (in bold 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, Stacy, what we put in here is '"RST guessing that this is at Waypoint 0. GPS Coords not so helpful" "Right" "OK so let's go back to the second image..."

This is a direct appropriation of a concept from a node that Simon had introduced into the flow (as opposed to a response to a verbal comment) into the participant's conversational flow: "it [the GPS coordinates] *isn't* helpful because we have to go back." The second half of Shannon's comment ("So, um, Stacy, what we put in here is…") occurs because Stacy is not able to view the Webex in this session, so Shannon from time to time brings her up to date on what the screen is showing. This interchange also serves as a participant validation of the text Simon had put into the node.

Focus. In this event Simon's focus is on the participants and the process, directing their attention to the process point he had made and implicitly requesting they discuss and validate it (which they do). He has a short indirect moment when he focuses on the map (and moves the node down) while he waits for an opening in the conversation.

Knowledge. Simon demonstrates knowledge of how to visualize the multiple meanings that nodes can have, by creating a second link to the GPS Coordinates node. He also demonstrates implicit knowledge of what kinds of facilitator interventions are appropriate as well as appropriate conversational turn-taking. He also demonstrates contextual knowledge in knowing the significance of the difference between Waypoints and GPS Coordinates (someone might easily think those were the same).

Communication. This event has three sub-segments of communication: RST members talking amongst themselves for the first sub-segment, then a conversation between Simon and the participants for the second, concluding with a return to an intra-RST conversation.

Tool/Artifact Use. The double-linking of the "RST guessing…" node that occurs during this event takes advantage of the rhetoric-visualization aspect of Compendium, showing that a particular node relates to two others. In addition, Simon keeps the "RST guessing…" node highlighted during the event, drawing the participants' attention to it by emphasizing its importance as the object he wants them to consider.

Skills/Expertise. Simon demonstrates a key facilitative skill – paraphrasing – in this event. From the long interchange in 62:30-62:49, the précis that he adds to the "RST guessing…" node is the succinct "GPS coords not so helpful", an artful pulling out of most significant thread from the stream.

Aesthetics. The making of the second link from "RST guessing…." in this event can be characterized as an aesthetic choice as well as a rhetorical one. Simon places the node in such a way that the link lines do not cross over any other nodes. His movement of the node downwards is to correct his earlier visual "mistake" from the FW4, when the link from "RST guessing…" crossed over several of the pre-existing nodes.

Ethics. Simon makes several choices about when and how to intervene in the RST's discussion during this event. In the first, he makes the choice not to interrupt during the "higher knowledge of the area" discussion, waiting until the participants had apparently finished (for the moment) discussing that subject. He then chooses to interject his point about the tool/data import/process issue, deciding that it was important enough to merit an interruption, and that he was justified in doing so. He then makes a further choice to allow the rest of the verbal comments in the event to belong to the RST, further choosing to enshrine the most salient aspect of their conversation ("GPS coords not so helpful") as part of the node label. He makes the implicit choice not to direct their attention to his act of including those words, but their merit is shown in Shannon's validation of them ("at this point it *isn't* helpful") when she describes what has been done on the screen to Stacy. It is also interesting to note that she describes this as what "we" have done on the screen, though the creation of the node and its editing was solely at Simon's initiative, without direct consultation with the participants.

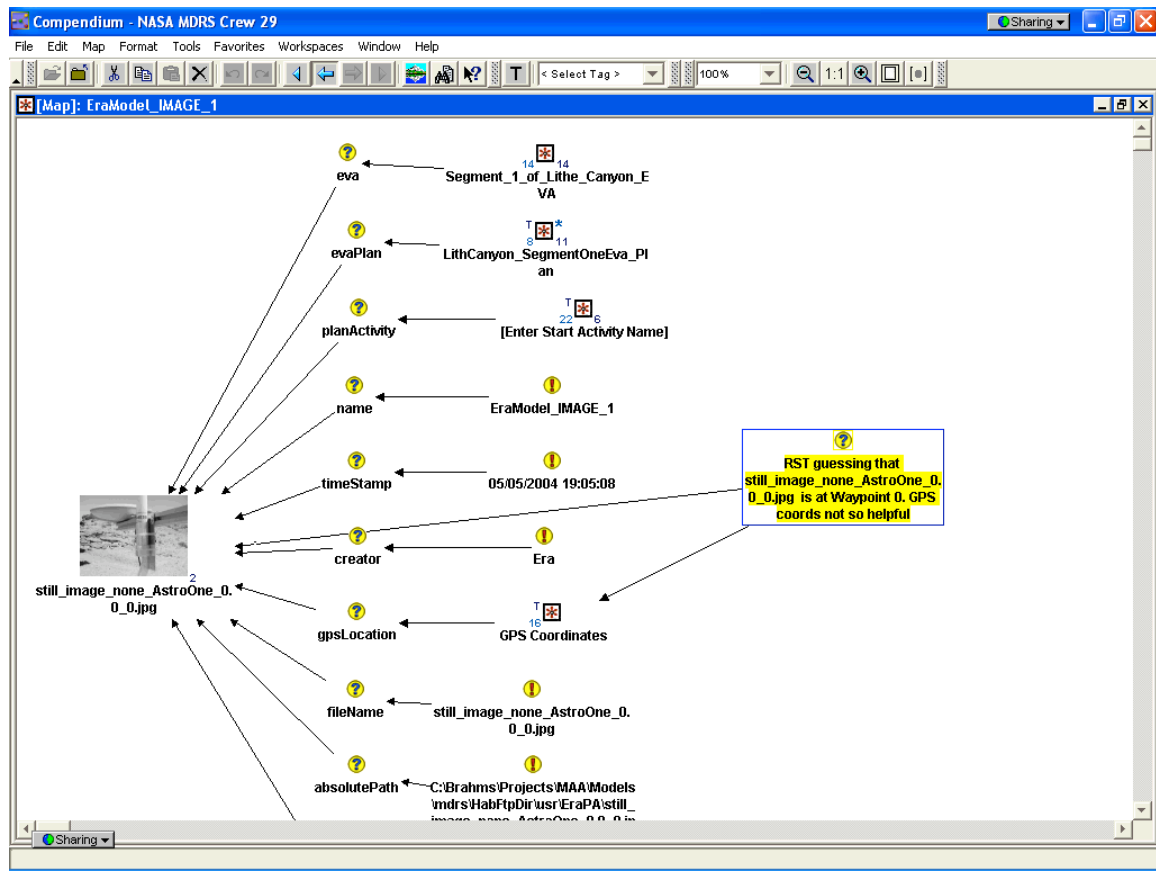### 3.3.3.7 Event FW7: Augmenting guess node with filename (63:14-63:29)

Figure 19: Screen at 63:29

Description. In this event Simon performs makes a final refinement to the "RST guessing…" node on his own volition, while the participants wait to see the next image in

the series display. There is no further interaction between Simon and the participants during this event, until the event concludes with Simon's navigation back to the "Segment_1_of_Lithe_Canyon_EVA May 5_2004 6:57PM_BST Science Data" map at the RST's direction to go to the second image.

The event is composed of five rapid Compendium movements, in which (in another seemingly instantaneously "planned" mini-project) Simon adds more specificity to the "RST guessing…" node by replacing the word "this" in the label with the actual filename of the image which the event has been concerned with. In the first, Simon moves the cursor over to the image file, clicks into the label, highlights the text and copies it (63:14-63:20). In the second, he moves the cursor back to the "RST guessing…" node and double-clicks its icon to open the Contents window (63:21). In the third (63:24), he highlights the word "this" in the Label field (the label at this point reads "RST guessing that this is at Waypoint 0. GPS coords not so helpful"). In the fourth, he pastes the filename text he had copied, which replaces the highlighted "this" with "still_image_one_AstroOne_0_0_0.jpg" (the label now reads "RST guessing that still_image_one_AstroOne_0_0_0.jpg is at Waypoint 0. GPS coords not so helpful"). Finally he clicks the "OK" button at bottom of the Contents window to conclude the sequence (63:28).

> Note: On the Camtasia video of the 6 May RST session, the last two of the above actions appear to happen after Simon has asked the RST members if they are ready to go back to the second image, but this is most likely due to the delay in the Webex transmission. Based on the sounds of clicking and typing in the background, the above actions were already complete by the time Simon asks "You want to go back to, this one?" at 63:23, so I do not analyze them here as they really are beyond the scope of the Finding Waypoints episode.

Focus. In this event Simon's focus is on the map and text labels. He does not interact with the participants while he accomplishes the text selection, copy, paste, and label edit.

Knowledge. His actions evidence an understanding of what type of information will be most useful to later viewers of the material produced in the session, including that actual filenames will be more specific and locatable than "this" which would be hard to understand out of context. He understands that in Compendium it is quite possible that the "RST guessing…" node will be viewed in a different context separated from the surroundings here, possibly even without a transclusive link (e.g. in a web export in which the current view was not included), so adding specificity will help maintain the integrity and usefulness of the information (it is not just adding specificity but a certain *kind* of specificity, tying the observations to the 'system name' of the object (the image node) that they refer to.

Communication. There is no verbal communication between any of the parties during the few seconds of this event.

Tool/Artifact Use. As noted above in "Knowledge", the manipulation Simon makes during this event shows an understanding of the different ways individual nodes can show up in Compendium or its produced artifacts, such as summary maps or web exports. By adding the specificity of the image filename to the label, he insures that future artifacts that include the node will retain sufficient information to be useful in as yet unanticipated contexts.

Skills/Expertise. The five actions in this event are performed very rapidly, while the RST was waiting for the next segment (consideration of the second image) to occur.

Aesthetics. No visual elements were added or modified during this event, but as noted above, there is a kind of "textual aesthetics" at work in Simon's crafting of the node label, adding a final bit of artful specificity before leaving this area for now.

Ethics. Simon makes the choice here to keep the RST waiting (for a few seconds) while he adds information to the node that he considers critical for later consumption (since it will have no immediate bearing on the participants themselves).

3.3.4 Event analysis: Revisiting the Finding Waypoints episode

I've named the second segment to analyze "Revisiting the Finding Waypoints Episode" In this episode, almost an hour later in the 6 May RST meeting, Simon and the participants come across the node created during the Finding Waypoints episode in the course of doing unrelated work. This discovery prompts some new, unexpected work to be done with the node.

Figure 9: Flow of events in Revisiting the Finding Waypoints

RF1. Trigger: Rediscovering the node while in the course of another action (119:43-119:47) → RF2. Tagging and copying the node (119:48-120:00) → RF3. Finding the Summary map (120:01-120:17)

RF4. Pasting and placing (120:23-120:27) → RF5. New trigger: "It's a different image" (120:28-120:36)

RF7. Pasting, placing, linking (121:06-121:20) ← RF6. Going back and getting the image node (120:37-121:09)

End
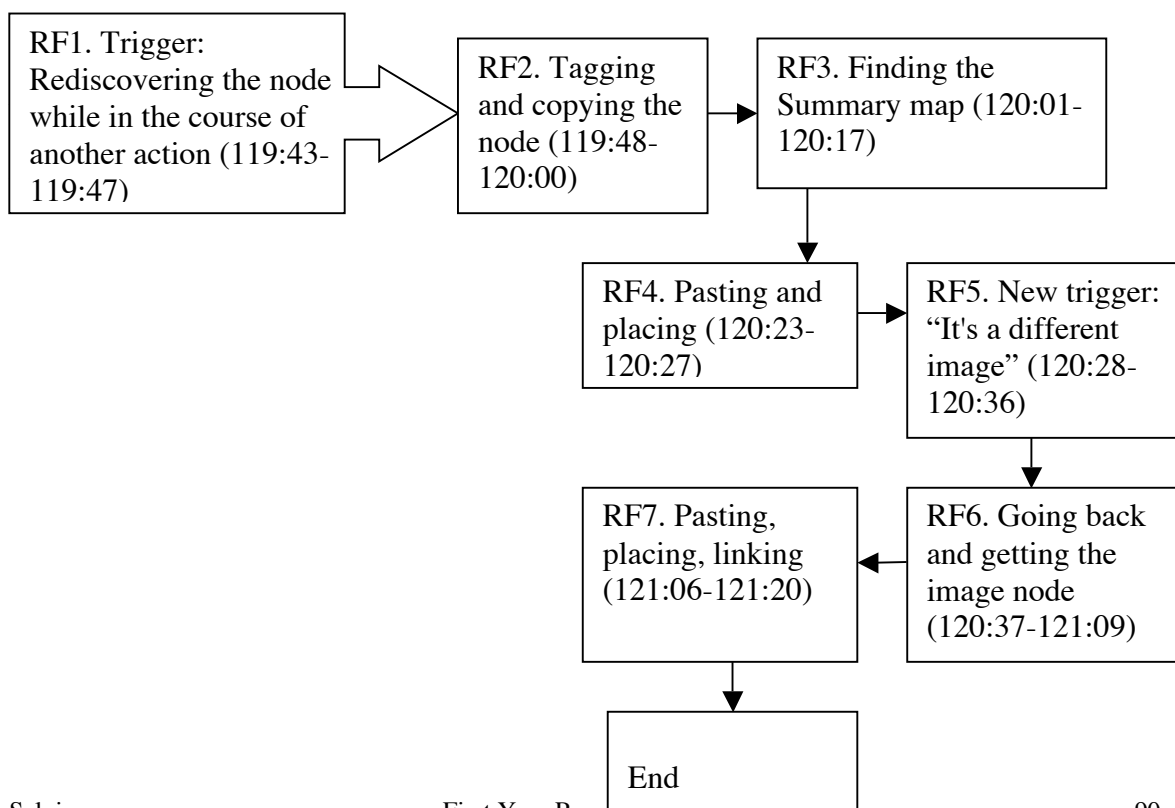
3.3.4.1 Event RF1: Trigger for Revisiting the Finding Waypoints episode
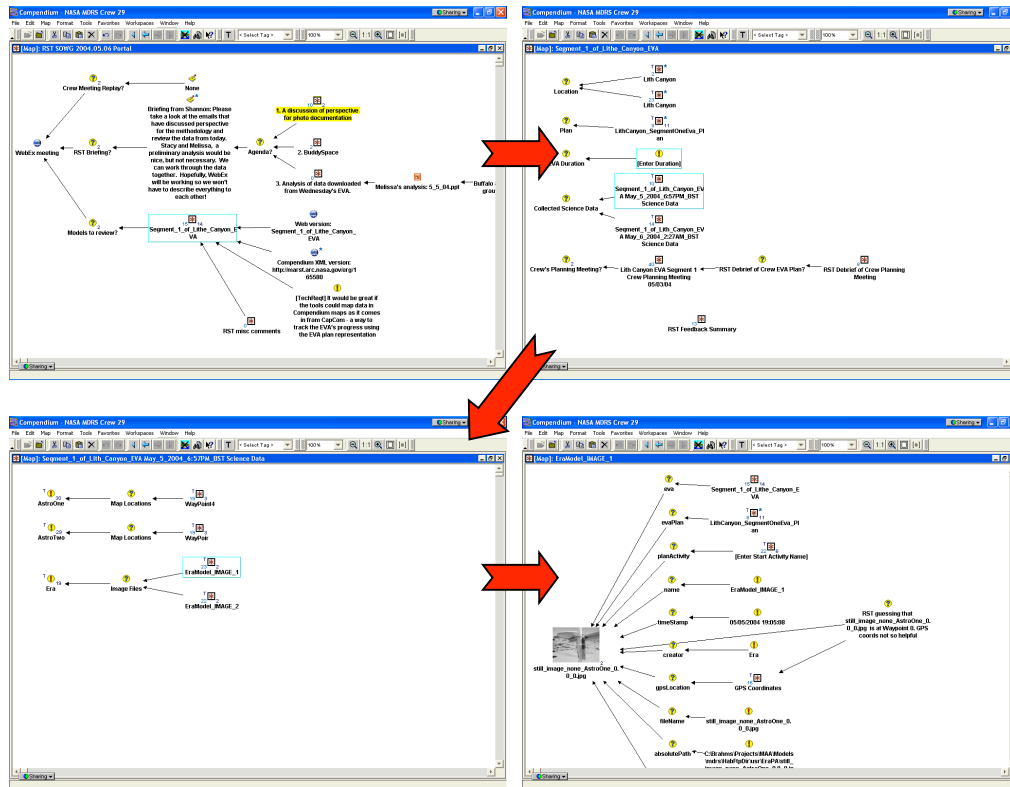
Figure 20: Navigation from 119:43 to 119:49

Description. This episode starts when Simon is in the midst of final preparations for the Summary map that will gather together all the material generated during the session for communication to the Hab crew. Just before the start, at 119:03, Shannon had asked Simon to navigate back to the Summary map (he had been working in other maps gathering and editing nodes for the Summary):

"where's the big map, our big feedback map?"

Simon responds:

"uhh…"

realizing that he doesn't immediately know how to get back to that map from where he is. He clicks around to several other maps, but the Summary map node is not in evidence in any of them. At 119:19 he says

"uhh... Gaah."

followed at 119: 30 (after a couple more navigation moves) by

> "Uh, hang on. Lost the summary map again."

At 119:31 he navigates back to the Portal map, commenting

> "Uhh… It's in there somewhere"

at 119:35. Following this he rapidly navigates through a series of maps (see Figure 20: Navigation from 119:43 to 119:49) still searching for the Summary map node. In the course of doing this, he opens the ERA_Image_One map and spots the "RST guessing…." node from the Finding Waypoints episode at 119:43 and comments:

> "Oh, we had this other comment here actually."

This is the trigger for the Revisiting the Finding Waypoints episode. Simon realizes that this node, which had not previously been tagged or copied into the Summary map, does belong there, and begins to perform some action on and with it.

Focus. In this event, Simon's focus is both a Direct engagement with the participants (primarily Shannon) and with the maps as he rapidly navigates around in search of the Summary map.

Knowledge. Simon demonstrates knowledge of what kinds of material would belong on a Summary map (i.e. be of sufficient interest to the Hab crew and other project members to be elevated to that status). This piece of interpretation happens very rapidly, on the fly while in the midst of another activity with a different goal (i.e. at that moment he was not looking for new material to add to the Summary map; rather he was simply navigating in search of that map). He demonstrates a knowledge of taking advantage of an opportunistic diversion from his ostensible immediate plan.

Communication. The communication in this event is between Simon and Shannon, first concerning the search for the Summary map, then the recognition of the value of the 'rediscovered' node. Simon's " we had this other comment here actually" comment is directly aimed at the participants, signifying the mutual value of his discovery for the main goal of their current efforts (constructing the Summary map).

Tool/Artifact Use.

Skills/Expertise. Simon displays considerable navigational skill in this event, moving rapidly between maps as he searches for the Summary map node, using three different navigation mechanisms (Map Back button, Window list, and opening map nodes via double-click).

Aesthetics. This event does not include aesthetic choices.

Ethics. Simon makes the choice to interrupt the flow of his search for the Summary map node in order to announce his re-discovery of the "RST guessing…." node and its implicit value for the Summary map. He chooses to foreground his own interpretation that the node is of value, rather than soliciting the opinion or approval of the participants. Here he takes the stance of a participant himself, one who is entitled to make value judgments on the suitability of material.

3.3.4.2 Event RF2: Tagging and copying the node (119:48-120:00)
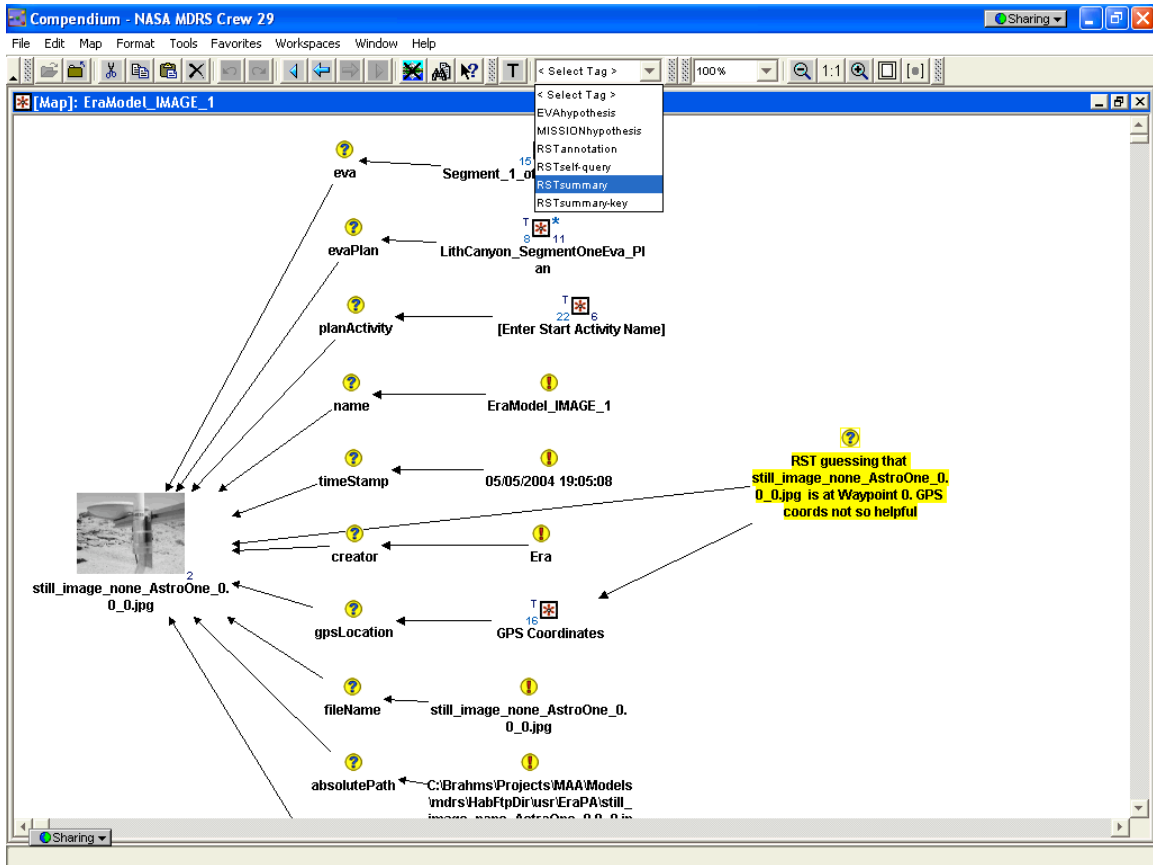
Figure 21: Screen at 119:56

Description. At 119:48 Shannon validates Simon's judgment that the node is of value to the Summary:

"Oh, that, yeah, good point."

Simon acknowledges this with the exclamation

"Umm…"

and sets about tagging the node (which for some reason had not happened earlier during the Finding Waypoints episode), first highlighting it then pulling down the Tags drop-down and selecting "RST Summary" (at 119:52). He also copies the node to the Clipboard.

Focus. In this event Simon's focus is primarily on the map, performing the tagging and copying actions called for by his apparent instant decision to incorporate the node into the Summary map.

Knowledge. Simon demonstrates knowledge of how to choose which one of the tags developed specifically for this project would be most appropriate/useful in the current context.

Communication. The brief verbal exchange between Shannon and Simon in this event serves to validate Simon's assessment that the node is worth including in the summary.

Tool/Artifact Use. The event shows the use of Compendium's tagging interface.

Skills/Expertise. Simon demonstrates the skill of how to apply a metadata tag to the node (he chooses "RST Summary").

Aesthetics. No particular aesthetic choices evidenced in this event.

Ethics. There is an implied choice in Simon's decision to tag the node before copying it and moving on to the next step, again without soliciting involvement of the participants in that action – i.e. the choice to tag the node and to choose the particular tag is his.

3.3.4.3 Event RF3: Finding the Summary map (120:01-120:17)
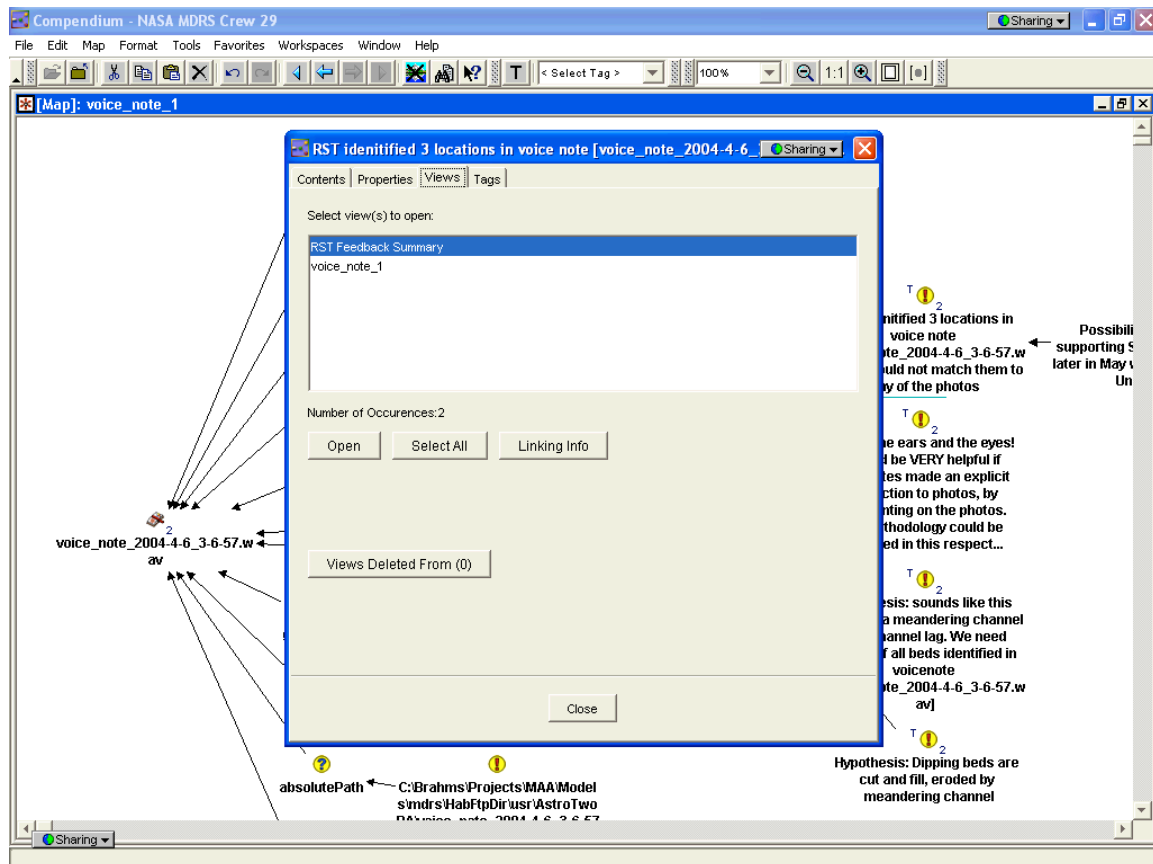
Figure 22: Screen at 120:12

Description. Simon resumes searching for the Summary map (which is what he had been engaged in at the time of the discovery in RF1), but this time with new purpose – to carry the now tagged and copied "RST guessing…" node to it. He narrates his navigation actions with the comments:

120:01 "Let me find…"
120:05 "…the summary map…"
120:05 "Here we are."
120:09 "OK, so there's our summary map."

This narrative occurs while he performs a rapid sequence of moves. At 120:01, amid the sound of lots of clicking, S clicks the Map Back button (at least) twice, which returns him to the Segment_1_of_Lithe_Canyon_EVA May_6_2004_2:27AM_BST Science Data map. At 120:06 he double-clicks to open "voice_note_1" map. At 120:10 he hovers over, then clicks on the transclusion indicator of "RST idenitified [*sic*] 3 locations in voice note…photos" to display the Views list for that node. He then double-clicks the "RST Feedback Summary" in that list, which at last opens the Summary map at 120:13. He dismisses the Views list window then moves around the view (left, left, up, down) to find the location where he will paste the copied node, completing this movement at 120:17.

Focus. In this event, Simon's focus is primarily on the navigation movements he is making, though he does keep a running commentary presumably for the benefit of the watching participants.

Knowledge. He demonstrates the knowledge of how to use Compendium's hypertext transclusions to navigate to his desired destination, as well as which node to look for that might have the transclusive links he needs.

Communication. Only Simon's verbal soliloquy occurs during this event.

Tool/Artifact Use. Simon takes advantage of the particular interface Compendium provides for navigating via transclusions (the Views list), as well as invoking that list via the visual transclusion indicator (the number at the lower right of a transcluded node). He also uses the Map Back and Map Open (double-click) methods of navigation.

Skills/Expertise. As with previous events in this analysis, Simon demonstrates the skill of using the various navigation methods very rapidly.

Aesthetics. This event is primarily navigational; no particular aesthetic judgments.

Ethics. Simon chooses to "entertain" the participants with a verbal narration of his actions during the rapid navigation, possibly to help keep them "with" him as he gets to the Summary map, keeping them engaged in the new purpose of conveying the rediscovered node to that map.

3.3.4.4 Event RF4: Pasting and placing (120:23-120:27)
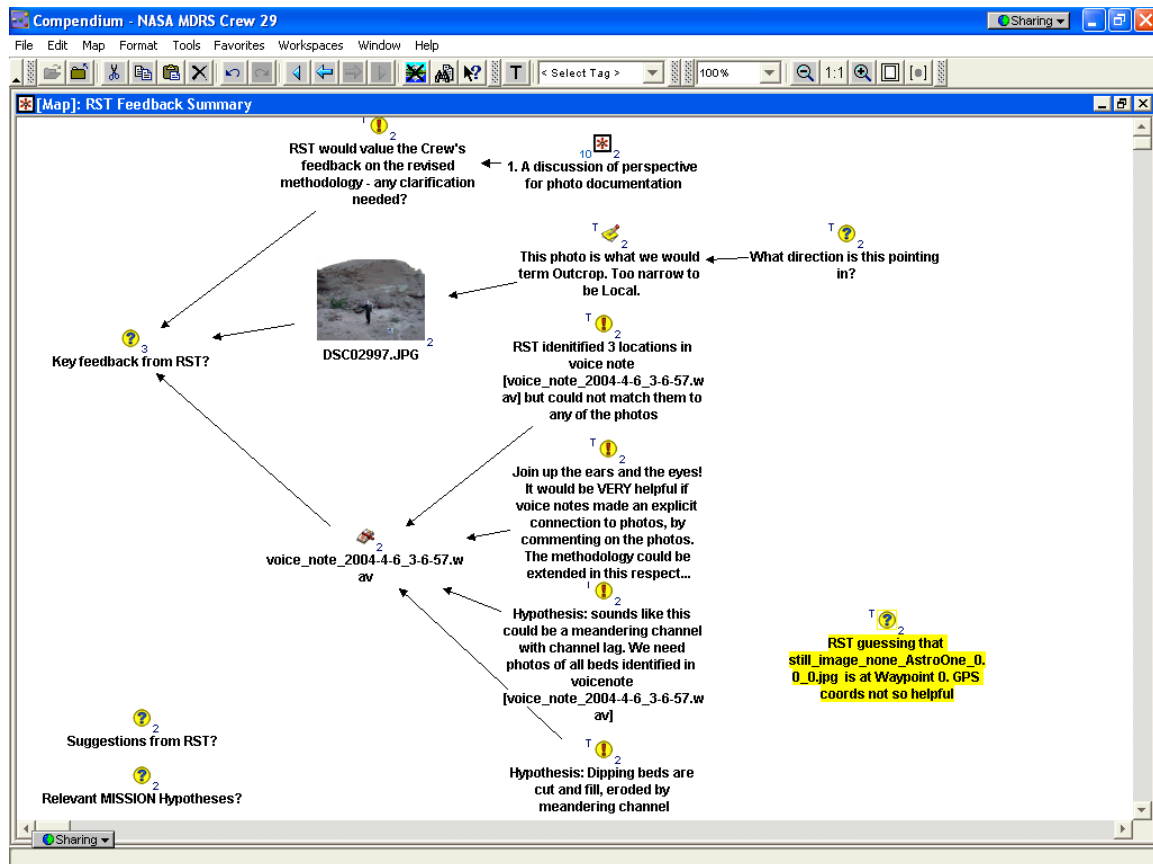
Figure 23: Screen at 120:26

Description. In this event Simon pastes the "RST guessing…" node into the Summary map and places it. At 120:23 Simon pastes in the "RST guessing…" node. It pastes in a location at the bottom of the map, partially overlapping another node, so at 120:24 Simon moves the node up and over to the left of the other nodes already in a view. Following this at 120:27 Simon moves the display down, seemingly preparatory to further arranging actions (putting the right collection of nodes at the bottom of the Summary map in focus).

Focus. In this short event, Simon's focus is completely on the map, performing the pasting and placing action.

Knowledge. In the movement of the node, Simon demonstrates knowledge of map layout (the move is preparatory to a linking action which occurs later).

Communication. No verbal communication in this event.

Tool/Artifact Use. No noteworthy tool use in this event.

Skills/Expertise. No noteworthy skill demonstrated in this event.

Aesthetics. Simon's placement of the node after he pastes it into the view is an instance of aesthetic choice about the eventual layout of the Summary map, which is completely a "crafted" map as opposed to an on-the-fly discussion capture or automatically generated map.

Ethics. No noteworthy ethical choices in this event, although it is an instance of a choice to work autonomously/indirectly in the midst of a conversational interchange with the participants.

3.3.4.5 Event RF5: New trigger: "It's a different image" (120:28-120:36)
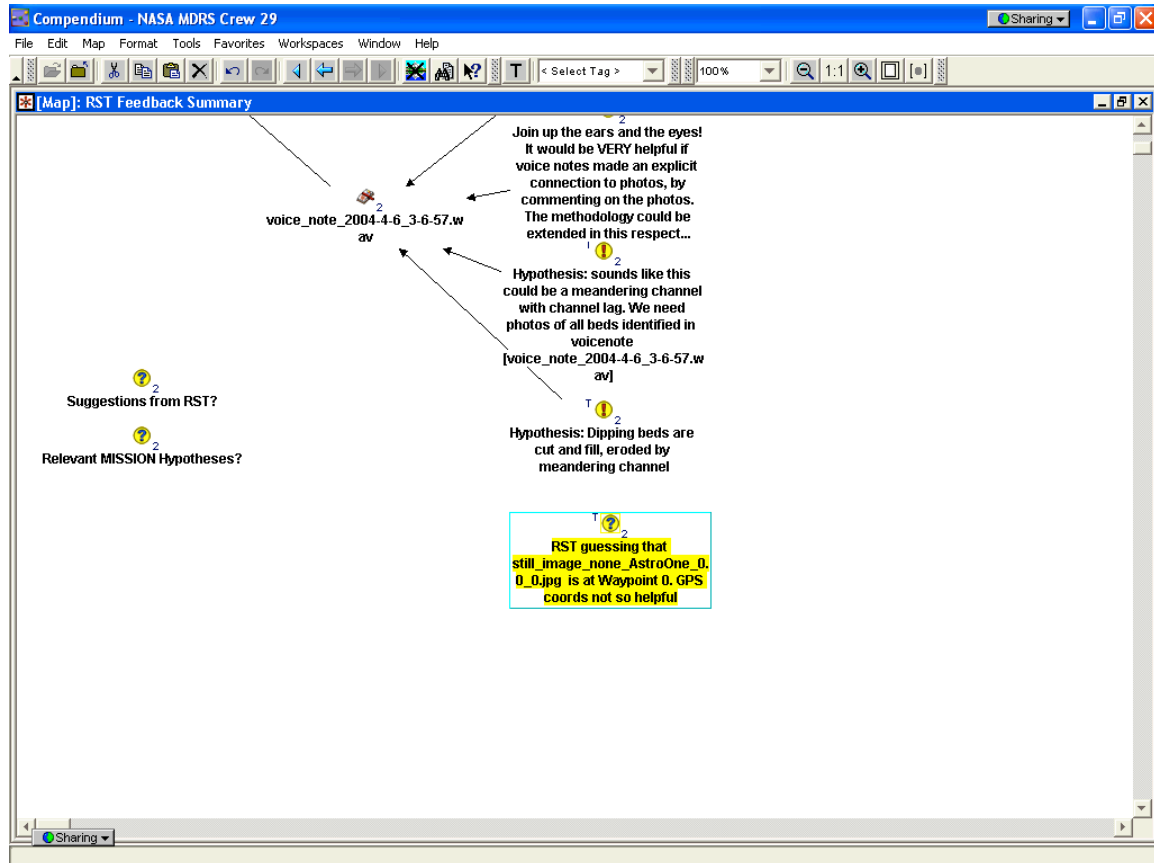
Figure 24: Screen at 120:36

Description. In this event Shannon comments on the placement of the "RST guessing…" node in this view, saying at 120:28

    "Yeah cause this is a different image, so."

This comment occurs because when Simon does the paste (in RF4 above) the node is near a previously paced image node, DSC02997.JPG, from another part of the day's meeting. The comment serves two purposes. It is an acknowledgement and/or validation of Simon's placing of the node in the view, but it also implying that the "RST

guessing…" node should not be linked to that image node. Simon acknowledges by saying (at 120:30:00)

"Yeah…"

Shannon's comment serves as a new trigger for Simon to develop another "instant" plan to cope with the implication that the node should not only not be linked to the image node already in the Summary view, but that more nodes need to be retrieved and added to the view (specifically the correct image node). At 120:36:00 Simon moves the node down and to the left to put it under existing nodes that are also 'comments' on an image node, preparing for the following set of actions (RF6 and RF7).

Focus. In this event, Simon's focus is on his verbal interaction with Shannon, responding to her comment, as well as on the map itself, beginning to carry out the implications of the comment.

Knowledge. He demonstrates knowledge of how to interpret the validity and importance of Shannon's observation, and how to translate it into immediate action (developing an "instant plan" for a mini-project that he immediately begins to carry out). It also shows his ability to carry several "plans" in parallel; he has not given up his current "master" goal of finalizing the Summary map, but rather added the new mini-project to the set of actions that he has to perform to accomplish that goal.

Communication. The brief verbal interchange in this event is an instance of the ability of participant and practitioner to communicate by implication. Shannon does not need to spell out what she means; Simon immediately grasps the implications of Shannon's comment, acknowledges them verbally, and begins to act based on this new information.

Tool/Artifact Use. No noteworthy tool use in this event.

Skills/Expertise. No noteworthy skills demonstrated in this event.

Aesthetics. Simon's movement of the node down and to the left shows a kind of anticipatory aesthetics; he puts the node where it will line up correctly with other nodes of a similar meaning, but anticipating its linking to a node that is not in the view yet. He already has the 'picture' of how the map should look based on actions he hasn't performed yet, and makes the mode of the node in this event to conform to that picture.

Ethics. Simon's verbal acknowledgement of Shannon's comment reflects his stance that participant judgments on not only the content of what is already in the maps, but the placement of nodes and the inclusion of something missing from the view, are valid and that he will respond to them and act on the basis of them. He immediately alters his apparent course of actions based on the "trigger" that Shannon's comment represents, and begins acting on the implied set of actions (the new mini-project) that the trigger implies.

3.3.4.6 Event RF6: Going back and getting the image node (120:37-121:09)
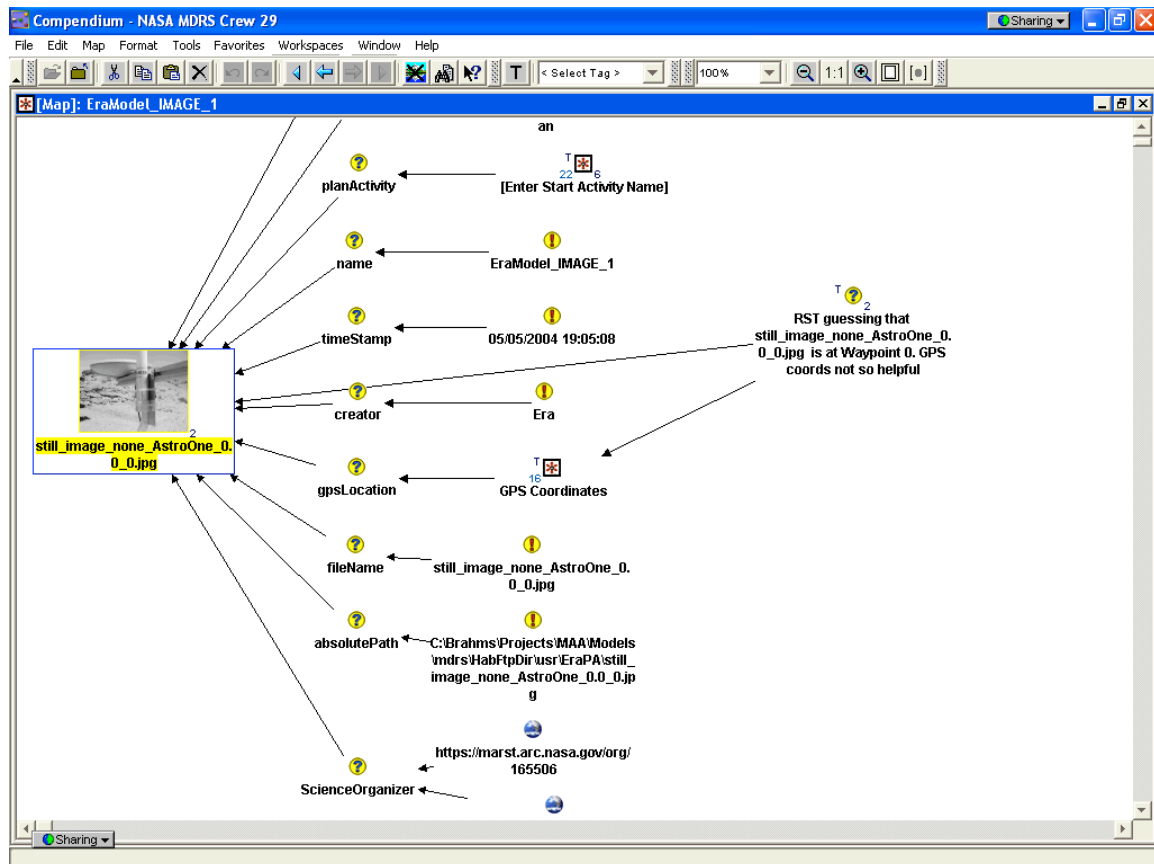
Figure 25: Screen at 120:58

Description. In this event Simon returns to the ERAModel_IMAGE_1 map to retrieve the image node to include it in the Summary map (the consequence of Shannon's comment in RF5), while carrying on a conversation with Shannon that references the contextual "story" about how the automated products of the software tools should interweave with the RST's process.

His first task is to return to the source map as quickly as possible. At 120:37 he clicks on Transclusion indicator of the "RST guessing…" node, which opens the Views list for that node. At 120:39 he double-clicks on "ERAModel_IMAGE_1" in the list, which navigates via the transclusion and opens the view behind the list window. At 120:43 he clicks Close to close the Views list, which reveals the ERAModel_IMAGE_1 map, which has opened (based on the position Simon was in when he last visited the view) too far to the right. From 120:44 to 120:46 Simon moves the view to the left twice, while commenting

"We should… yeah. We really shouldn't be in any doubt where an image is."

Shannon acknowledges this at 120:46:

"Yeah."

Now that it is showing, Simon highlights the image node and apparently copies it at 120:46. He continues the exchange with Shannon:

"I thought that the all these maps of course are generated automatically by uh, by Brahms agents, but…."

To which Shannon responds at 120:53:

"Right."

Simon continues (120:53-120:01):

"They should be unambiguous… why, why is it not possible for us to figure out which waypoint this is at… that's quite strange…"

At 120:59 Simon moves the map down slightly (unclear why), followed by hovering momentarily over the transclusion indicator for the "Segment_1_of_Lithe_Canyon_EVA" map node, showing the long list of transcluded containing views in the rollover, possibly because he was thinking of using the Views list to navigate again?). At 121:04:00 Shannon responds to Simon's comments about the tools:

"Yeah I mean we're literally making the assumption that since we were in on the planning meeting... we know where it is."

Focus. As in the previous event, Simon's focus is both on his conversation with Shannon and on the manipulations of the tool that he is performing. His verbal comments focus both on the immediate context within the tool, but also on the larger context.

Knowledge. Simon demonstrates the retained knowledge/memory of where the node he is in quest of (the image node) would be located in the map he was returning to – he knows where to move the display to find that node.

Communication. The verbal interchange between Simon and Shannon in this event is the closest to a true conversational exchange in this episode. It has the character of an exchange of ideas on several levels – both about the immediate task and how the situation reflects on larger questions of the RST processes and the tools used in the Mobile Agents experiment.

Tool/Artifact Use. This event shows the use of a transclusion to navigate and the retrieval of a node to augment an existing transclusion (the "RST guessing…" node in the Summary map) with a new one (the image node that Simon is retrieving).

Skills/Expertise. Simon demonstrates the skill of being able to perform complex manipulations of the software while carrying on a conversation, as well as the ability to

use multiple navigation mechanisms in the course of a rapid retrieval of a node from a previous view to populate the view he's mainly working on.

Aesthetics. This event is primarily navigation and retrieval in service of a forthcoming aesthetic "event" (covered in RF7); no particular aesthetic judgments in this event.

Ethics. In some respects this event is the result of the choice already made in the previous event (RF5), and does not contain any new choices. There is, however, the action of discussing the larger context ("They should be unambiguous…") while performing the main actions of the event, reinforcing the legitimacy of discussing one of the framing concerns of the Mobile Agents experiment (the effectiveness of the tools) during the actions of the RST meeting itself.

3.3.4.7 Event RF7: Pasting, placing, linking (121:06-121:20)
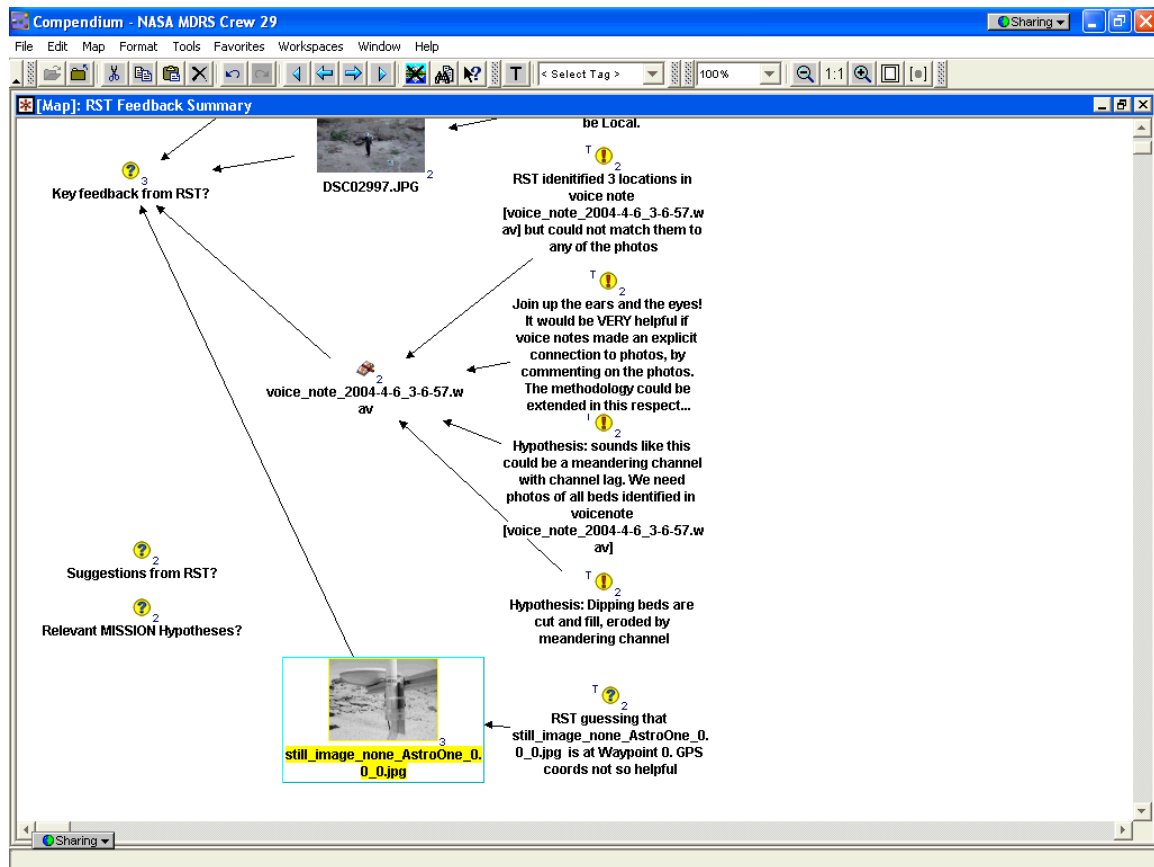

Figure 26: Screen at 121:20

Description. In this event Simon completes the action of returning to the Summary map, pasting the retrieved image node, placing it on the map, and linking it to the "heading" node.

At 121:06 Simon clicks the Map Back button to go back to the "RST Feedback Summary" map. On arrival at 121:08 he pastes in the "still_image_none…" image node,

which pastes in partially covering the "RST guessing…" node. At 121:10 he moves the pasted node up and to the left, moving it into position between "RST guessing…" and the node ("Key feedback from RST?") that serves as the "heading" for the various summary items that refer to RST observations on the other images and voice notes.

At 121:12 Simon highlights "RST guessing…" and links it to the pasted image node. At 121:15 he then moves the map display up so that the "Key feedback from RST?" node is visible, then at 121:16 he links the image node to the "Key feedback from RST?" node, completing the logical "chain" commenced at the start of the Revisiting Finding Waypoints episode. Finally at 121:20 he moves the image node down and slightly to the right so as to line up horizontally with the "RST guessing…" node.

During the above actions, Simon and Shannon continue their conversation from the previous event. At 121:10 Shannon says

"And we could be completely wrong, I mean I'm assuming we're right, but…"

Simon acknowledges at 121:15:

"Yeah…"

Focus. In this event, Simon's focus is again on both completing the map/node/link manipulations that he started in RF1, and on the ongoing discussion with Shannon.

Knowledge. Simon's rapid manipulations of the placement of the pasted node in between the two nodes he would then link it to show (some kind of) internalized knowledge of the map layout and the meaning of the two nodes with relation to the pasted node (i.e. that the pasted node would be one of the "subjects" to which "Key feedback from RST?" would refer to, and that in turn "RST guessing…" would be a subject of the pasted image node).

Communication. Simon and Shannon continue their conversation from the previous event (though the partially abstracted character of Simon's responses reflect his absorption in the rapid complex manipulations he's making, and the indirect nature of the conversation with relation to the specific action he takes in the event).

Tool/Artifact Use. This event includes two linking actions, a paste/transclusion create, and node arrangements to create the intended set of relationships between ideas.

Skills/Expertise. Simon performs the four actions rapidly, bringing the instantly-planned arrangement into being and refining it while continuing to converse with Shannon. The actions in the event bring to culmination the retrieval of a node located many views "away" and placed in a meaningful arrangement in the Summary map, adding to its usefulness.

Aesthetics. The aesthetic choices in this event include Simon's placement and linking of the image node in a new location at the bottom of the existing set of Summary nodes, and his refining movement at the end that aligns the image node horizontally with the "RST guessing…" node that refers to it. These help strengthen the visual and rhetorical "story" that the Summary map tells.

Ethics. As with the previous event, there are no new ethical choices in this event; rather it completes the instant-planned action while continuing the conversation.

3.3.5 Event analysis: Final Annotation episode

I've named the third segment "Final Annotation." In this episode, eleven minutes after the Revisiting Finding Waypoints episode and in the final minutes of the 6 May RST session, Simon is in the midst of final arranging and formatting of the Summary map. While moving the nodes from the Finding Waypoints episodes into a new position, he apparently has a new thought, so adds a new node with a clear statement of the technical requirements implied by the problem with the Waypoints data. He then discusses the new node with Shannon, which leads to a final refinement of the text in the node (and an end to the evolution of the nodes focused on in this analysis).

Figure 16: Flow of events in Final Annotation
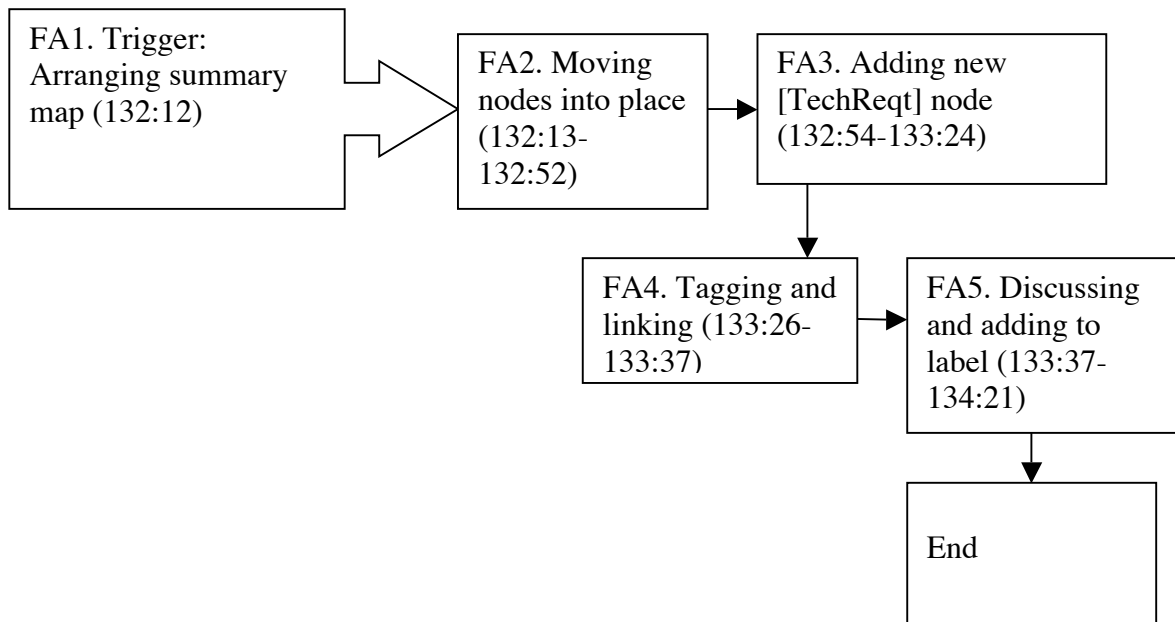
3.3.5.1 **Event FA1: Trigger: Arranging summary map (131:59-132:12)**
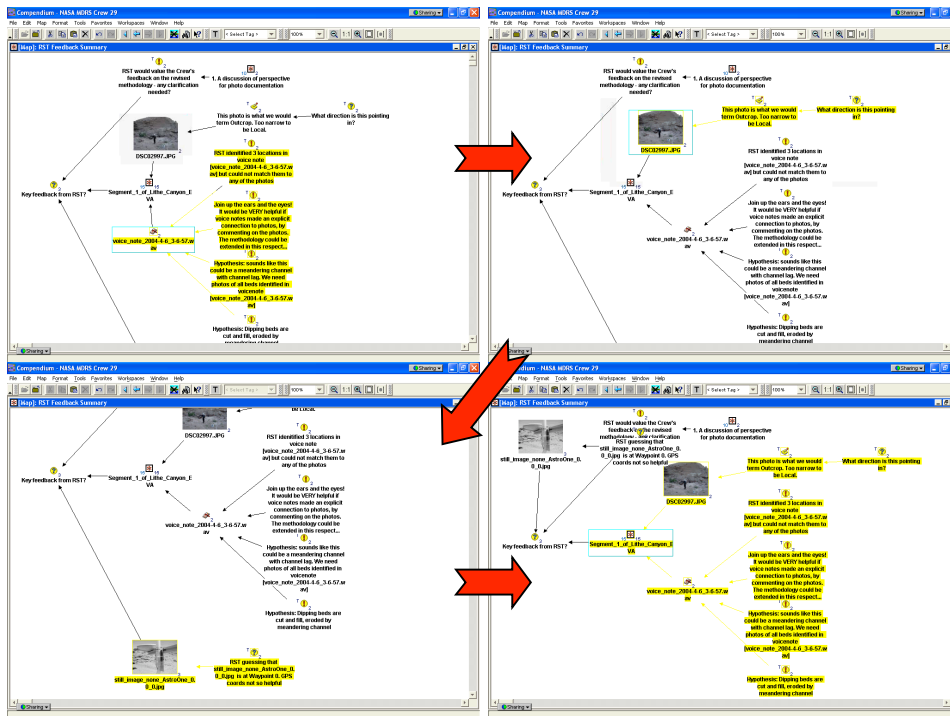
Figure 27: Screen changes from 131:59 to 132:12 (selected)

Description. In this event, Simon performs a number of moves to arrange the nodes and links on the Summary map for final publication, while Shannon and Melissa conduct a separate conversation in the background (not concerning RST subject matter). Simon's moves include a number of "tree-selects" (selecting a whole subtree of nodes with one gesture) to move them into a better position. The refinements he makes in this event are not just visual, but are refining the logical and expressive relationships between the concepts and data pictured. For example, he creates a new map architecture to show that the image and voice note nodes are subtopics of the EVA.

In the course of this work, he goes to the bottom of the map, where he had last left the "still_image_none…" and "RST guessing…" nodes. That is the trigger for the Final Annotation episode.

Focus. In this event, Simon's focus is completely on the work he is doing on the maps, which is all "crafting" work on the visual/expressive representation. He is probably at least monitoring the participants' discussion, but it has no bearing on the work he is doing.

Knowledge. He demonstrates the knowledge of a variety of structuring conventions, ways to group and characterize all the information on the map for the best presentation/communication to other people involved. Also, the work happens in the

context of the pre-existing RST Summary template, so the manipulations are refinements of how best to "map" the day's results onto that template.

Communication. There is no participant/practitioner verbal communication in this event.

Tool/Artifact Use. Simon makes extensive use of subtree-selections and movements of collections of nodes and links at once, manipulating what are in effect whole sub-conversations that have occurred during the session so that the Summary map constitutes a more effective "publication" of the day's results.

Skills/Expertise. The decisions of what node/link collections to select, place, and relink happen very quickly, corresponding to a mental model (since there is no pre-existing prescriptive guide of how to do this mapping (of the specifics from the day's session on to the nodes in the RST Summary template); each move, placement, and linking is a new decision of how best to represent the material.

Aesthetics. This event demonstrates some fine-grained aesthetic crafting of the Summary map representation, but since it is not the focus of the Final Annotation episode, I won't analyze it in detail.

Ethics. Simon chooses to work in a "delinked" mode, autonomously without participant input, on his crafting activities.

3.3.5.2 Event FA2: Moving nodes into place (132:13-132:52)
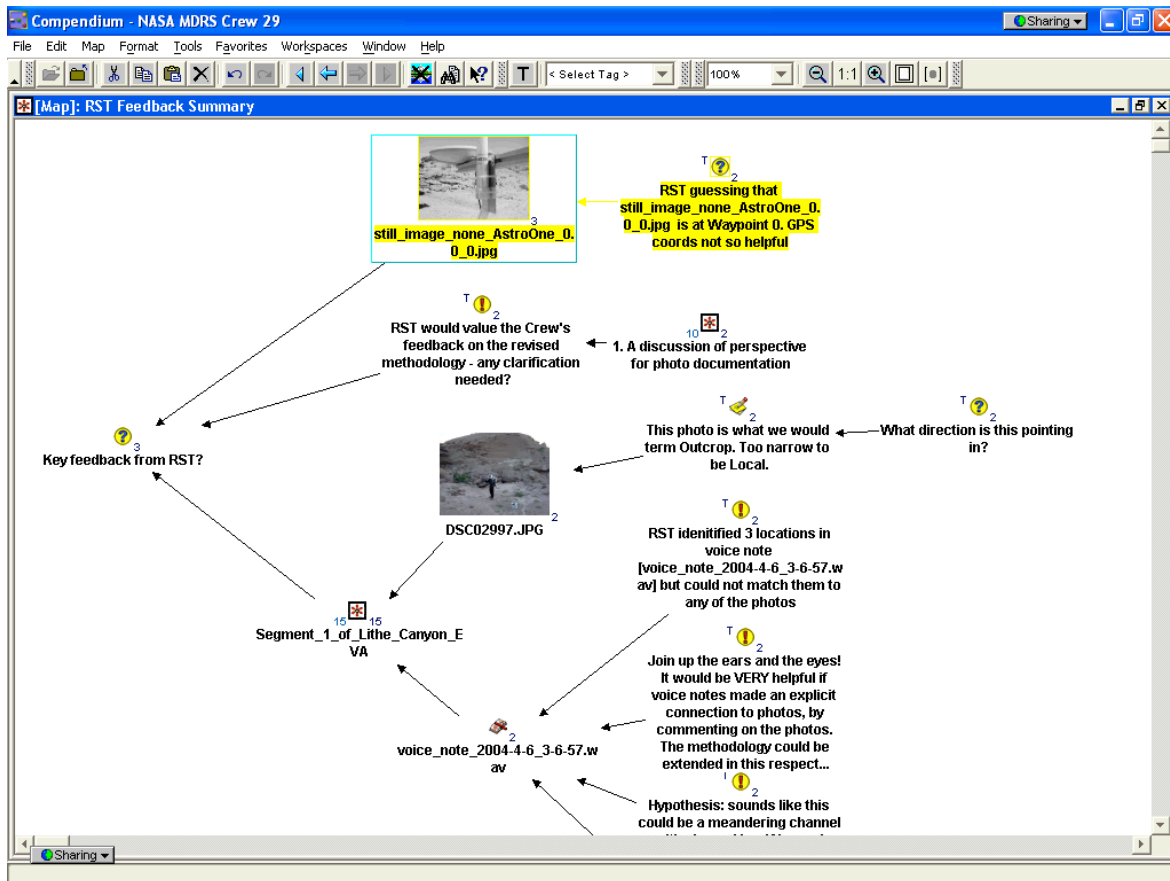
Figure 28: Screen at 132:35

Description. In this event, Simon performs a dense, rapid series of complex placement and linking/delinking moves (13 moves in 39 seconds) to get the "still_image_none…" and "RST guessing…" nodes and link to the top of the Summary map. All of the moves continue in the "delinked" mode (no interaction with participants, who continue to discuss the imminent birth of a colt from one of Shannon's horses).

At 132:13 Simon drags to select the "still_image_none…" and "RST guessing…" nodes at the bottom of the Summary map. He then moves them to the upper left of the map (as far as they'll go). They overlap some of the existing nodes that are there, so he next at 132:24 tree-selects the "Segment_1…" map node and all nodes linked to its right, and moves them down to create space. Next at 132:27 he drags to select "RST would value…" and "1. A discussion of…" and moves them down into the space created.

At 132:31 he tree-selects the "still_image_none…" and "RST guessing…" nodes and moves them to the left into their new 'final' position. At 132:40 Simon selects the "Key feedback from RST?" root node and moves it down and to the right, probably just to create a better visual alignment with the new arrangement of nodes linked to it. At 132:46 he moves the map down to get to (at 132:47) the "Suggestions from RST?" which he

highlights then deletes, as it had nothing linked to it so would not be necessary (would just be clutter) to include in the final version of the Summary map. He must have noticed this in the process of retrieving the "still_image_none…" and "RST guessing…" nodes at 132:13. At 132:48 he moves the display back up then at 132:52 selects the "Key feedback from RST?" root node and moves it slightly to the left.

Focus. In this event, Simon's focus is completely on the maps. No interaction with the participants.

Knowledge. He continues the demonstration of expressive map layout "design" as in FA1.

Communication. No verbal communication with the participants in this event.

Tool/Artifact Use. This event continues the manipulation and arrangement of the Summary map for publication (as web export, as well as a map that the Hab crew will directly consider) as in FA1.

Skills/Expertise. Continues the very fast manipulation and arrangement as in FA1, here using tree-selects, linking/delinking, node movements, and node deletions to get the "still_image_none…" and "RST guessing…?" nodes into the right positions with respect to the other nodes in the view.

Aesthetics. Simon makes a number of aesthetic choices in this event. Eight of the thirteen moves are in service of taking the "still_image_none…" and "RST guessing…" nodes from their place at the bottom of the map and putting them in the topmost position, necessitating the movement of two other node-clusters to lower locations. It isn't clear why he felt they should be at the top, though possibly it was because of the relative importance of the ideas they express for the overall Mobile Agents project (bearing as they do on the design of the tools and the way the tools' outputs are used). Second, he deletes the "Suggestions from RST?" node, deciding (evidently) that since nothing was going to be linked to it (he already knows the extent of nodes that could be added to the Summary map at this point, given that the ostensible time limit for the session had already passed) it would be a better layout of the Summary map not to include that template node in the final version for the day. Finally he makes several small refinements of node positions not tied to broader placement moves, probably to make the link lines more perfectly horizontal and improve the visual appearance of the map.

Ethics. Simon continues the "delinked" mode of working here, choosing to focus closely on his manipulations of the map elements without looking for input or validation from the participants. He is also driven by the need to finish quickly to meet the deadline for publication of the day's results, so he is working as fast as possible to get as much "into" the map as he can.

3.3.5.3 Event FA3: Adding new [TechReqt] node (132:54-133:24)
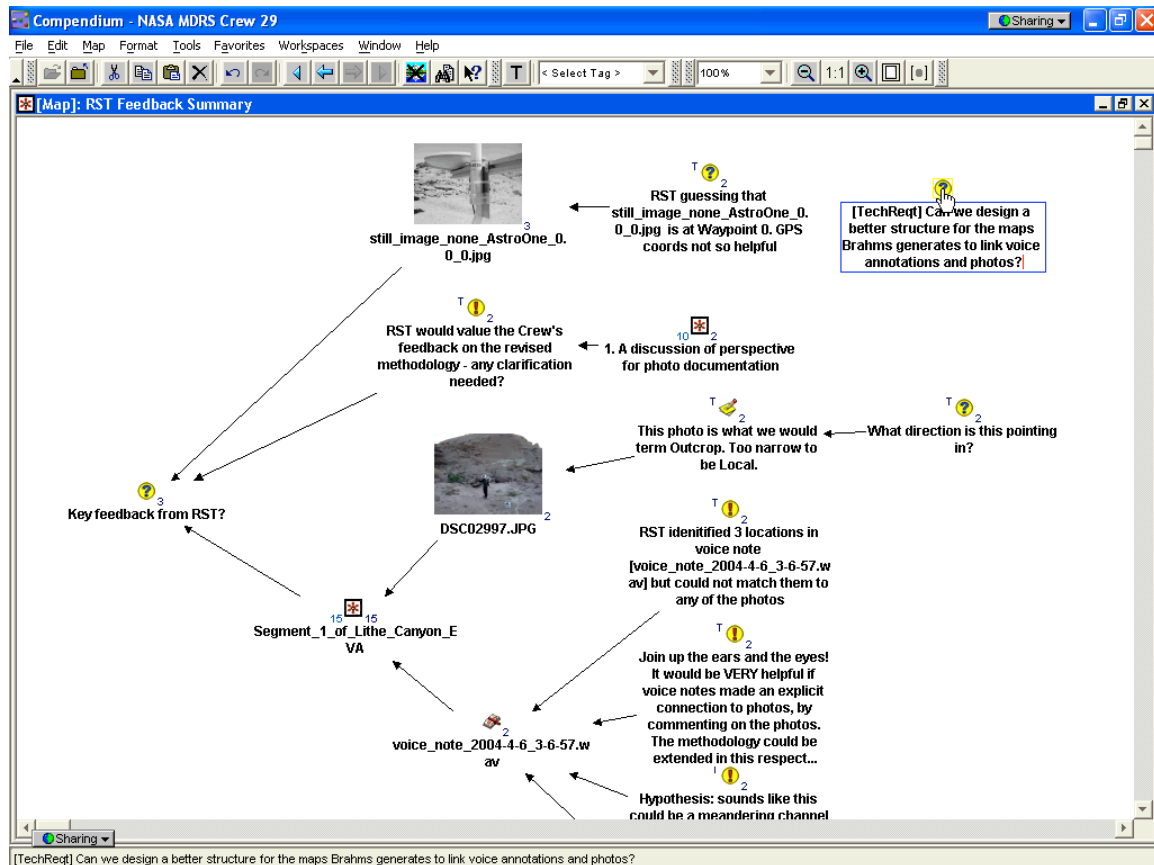
Figure 29: Screen at 133:24

Description. In this event Simon adds a new node distilling the lesson learned from the earlier Finding Waypoints episode into a technical requirement statement for future evolution of the Mobile Agents software tools. The node makes explicit a piece of the earlier discussion about what Brahms ought to do with Waypoint information. He prepends the note with the text "[TechReqt]" to make it stand out more, stamping it as an official statement of a kind. He makes an initial attempt to interrupt the conversation between the participants, then continues creating the new node's label text.

At 132:54 Simon creates a new Question node to the left of "RST guessing…." and starts to give it the Label "[. He simultaneously says

> "I'm just putting in a note here about…"

but Shannon and Melissa don't hear him and continue their discussion of Shannon's horse, so Simon abandons the verbal communication attempt and instead continues editing the Label in the following stages: "[TechReqt] Brahms" then "[TechReqt] Can we design a better structure for the maps Brahms generates to link voice annotations ad photos?"

Focus. In this event, Simon's shifts his focus from "delinked" map manipulations to new node creation, intended to be done in conversational mode with the participants (though he is not yet able to draw them into discussion).

Knowledge. The creation of the "Techreqt" node shows a knowledge of what sort of information would "count" as a technical requirement for software tools, distinct in kind from other statements made during the session and captured in the Summary map. The use of the brackets ("[ ]") surrounding the "Techreqt" text demonstrates a knowledge of the ways to use typographical conventions to make certain kinds of information stand out in particular ways.

Communication. Simon makes an attempt to draw the participants into a new discussion about the node he is adding, but they don't hear him and continue their delinked conversation.

Tool/Artifact Use. Simon creates a new node in this event and populates its label. The use of the square brackets is something of an on-the-fly convention created to make the node stand out as a new sort of category (the convention had been used once, earlier in the same day's RST session, on a node labeled "[TechReqt] It would be great if the tools could map data in Compendium maps as it comes in from CapCom - a way to track the EVA's progress using the EVA plan representation", and was not used again in the Mobile Agents project). Interestingly, neither node given the "[TechReqt]" label prefix was Tagged.

Skills/Expertise. No notable skills demonstrated in this event, beyond the use of the square brackets used "typographically."

Aesthetics. Simon chooses to place the new "TechReqt" node to the right of, and linked to, the "RST guessing…" node (as opposed to, say, the image node). This choice implies that the technical requirement "modifies," and is in some sense a meta-comment on, the earlier more "reportorial," process-descriptive "RST guessing…" node. It thus elevates the sensemaking dilemma experienced by Simon and the participants into an explicit statement of the technical implications of that dilemma for future software development and tool evolution.

Ethics. Simon chooses to take the earlier experience and express it as a technical requirement. He does this independently during this event, but the content of the new node is drawn from his discussions with the RST earlier in the session. Nonetheless he is clearly adding this comment based on his own priorities and ideas rather than it being drawn from or at the instigation of the participants.

3.3.5.4 Event FA4: Tagging and Linking (133:26-133:38)
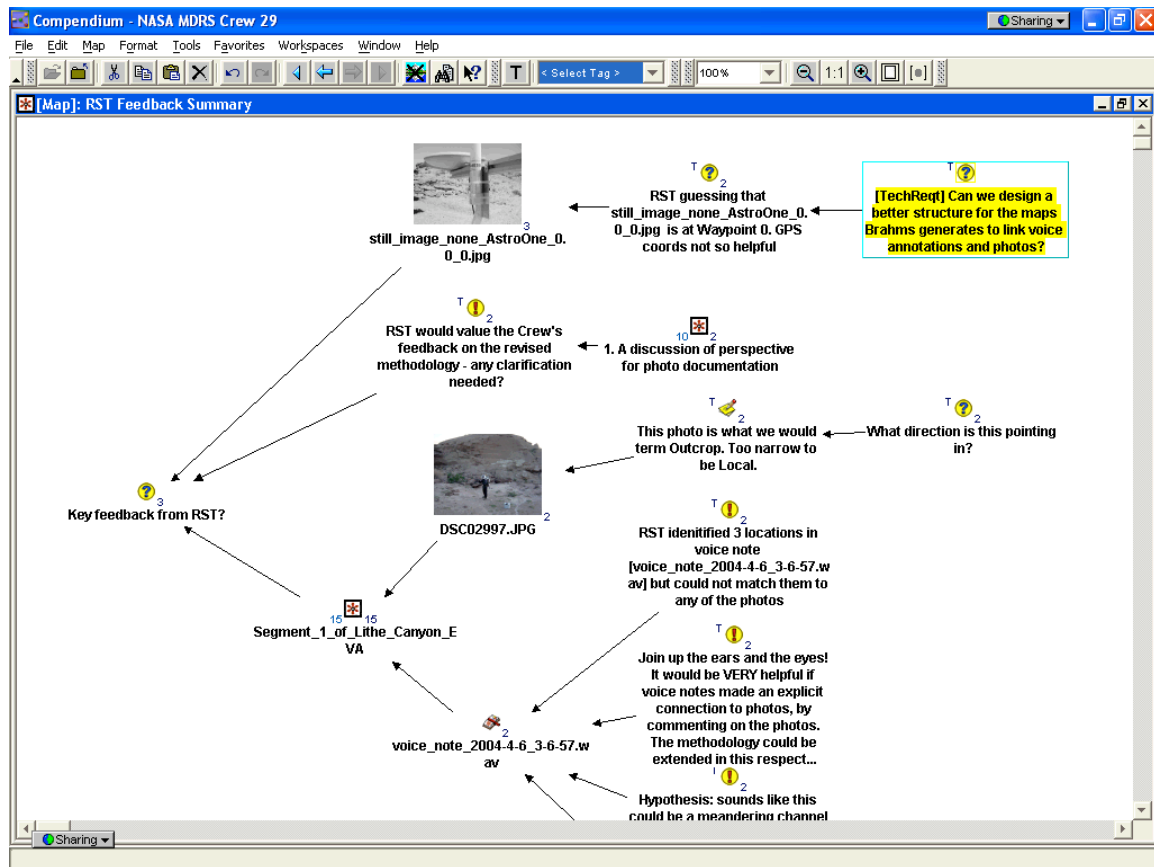
Figure 30: Screen at 133:38

Description. In this event Simon returns to delinked mode to tag and link the new node and refine its position slightly. In the background, Melissa and Shannon conclude their conversation and Melissa says goodbye (at 133:34), then drops off the call.

At 133:26 Simon highlights the "TechReqt" node, then at 133:30 goes to the Tags menu and selects "RSTAnnotation", giving the node that Tag. At 133:33 he links the node to the "RST guessing…" node, then moves the node slightly up and to the right.

Focus. In this event, Simon's focus is again completely on the map, completing the tagging, linking, and placement of the new node.

Knowledge. In his choice of "RSTAnnotation" he demonstrates the knowledge of the metadata tagging conventions developed for the Mobile Agents experiment.

Communication. There is no practitioner/participant verbal communication in this event.

Tool/Artifact Use. Continuing and cementing the implication of the placement of the "TechReqt" node in FA3, Simon's linking of the node to "RST guessing…" indicates that the new technical requirement was derived from – born in – the consternation

experienced by the RST and recorded in the "RST guessing…" node. The image node itself ("still_image_none…"), which now appears in both its original home on the "EraModel_IMAGE_1" map and in the Summary map, serves as both a piece of science data, an object to be looked at and considered apart from any specific context, but also as a sort of objective correlative of the significance of the problem of missing metadata (the Waypoints information). The two nodes now linked to it in a sort of chain of increasing abstraction or implication, "RST guessing…" and "[TechReqt]…", both connect the (otherwise and elsewhere unrecorded) need for both particular metadata (the Waypoints information) and particular software toolset support to produce and indicate that metadata.

Skills/Expertise. Simon demonstrates use of the Tags interface and linking in this event.

Aesthetics. Simon's final positioning movements of the node, as in earlier such movements, are primarily to make it in "perfect" horizontal alignment with the "RST guessing…" node that it's linked to so that the link line does not contain any "jaggies." The other practitioner choices in this event have more to do with the concerns described in the Tool/Artifact section directly above than "purely" aesthetic choices per se. My future analytical work will be to try to consider in what ways the categories used in this document need to be restated or recombined, since the boundaries between them are so fluid and not well-defined.

Ethics. By making the chain of implication from image to process comment to technical requirement explicit, Simon makes it more likely that the points expressed here would be taken up by subsequent analysis, research, discussion, and tool development.

3.3.5.5 Event FA5: Discussing and adding to label (133:38-134:21)
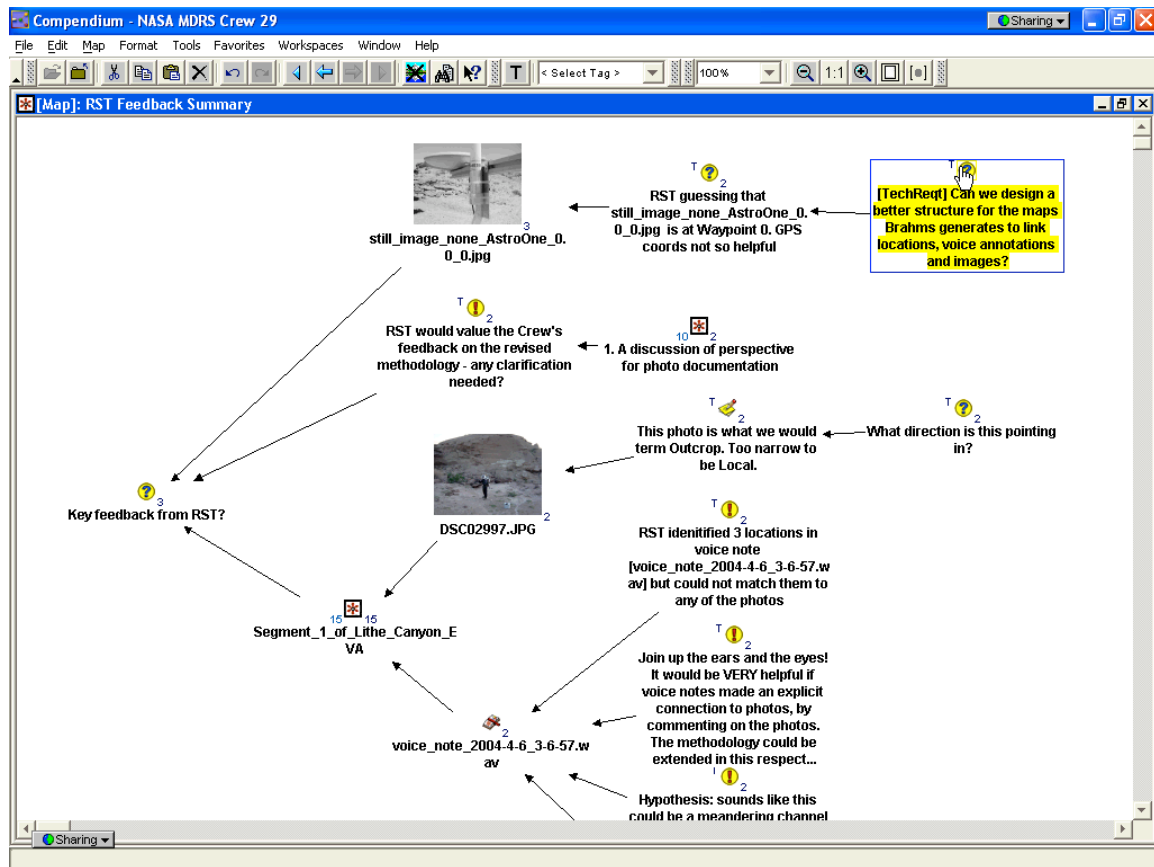
Figure 31: Screen at 134:15

Description. In this final event of the episode, Simon describes the new node he's created to Shannon. His explanation triggers a refinement of the label, which he accomplishes while he and Shannon continue to discuss the implications of the ideas expressed. Except for this bit of node editing, the primary character of the event is a verbal conversation, occurring while Simon points at the various nodes with the cursor for visual emphasis.

At 133:37, just after Melissa says goodbye and drops off the call, Shannon says

> "I'll hang around until… everything's… done...

Simon takes this opportunity to describe the new "TechReqt" node at 133:39:

> "OK. Shannon I just added a note here about y'know the fact that we couldn't figure out where this image was."

Shannon responds at 133:47:

> "Yeah."

Simon continues (133:47 to 133:56):

"Um. It's something to do with the way the maps are generated I think, and it sh it might be possible to, to really make that quite clear… um…"

This statement appears to trigger a refinement of the label. At 133:53 Simon highlights the "still_image_none…" node as they discuss it, and while Shannon validates his thoughts at 133:56:

"Oh that would be good."

Simon responds (at 133:57) with the exclamation

"Uhh…."

accompanied by clicking into the label and editing the label to change it from "[TechReqt] Can we design a better structure for the maps Brahms generates to link voice annotations and photos?" to say "[TechReqt] Can we design a better structure for the maps Brahms generates to link locations, voice annotations, and images?", thus adding the specificity implied by his verbal comments in this event.

While he does this, Shannon continues (from 133:58 to 134:09):

"Because when it comes down into Science Organizer, it's they're very hard to link so you think you would be able to link them in Compendium because everything is linked."

At 134:09 Simon acknowledges Shannon's comment, and continues to reflect on the implications:

"That's right, it's just a question of generating the right maps, so we're not looking at something and saying 'well, which waypoint is this'… that's… I'd… I'm going to have to look at that."

Following this, at 134:20, Simon abruptly shifts gears to end the episode:

"OK. Right. Shall I send this off then?"

Focus. In this event, Simon's focus is mostly on his conversation with Shannon, discussing the node he's just created and its implications for the larger concerns of the Mobile Agents experiment. He is also still very much focused on the label text of the "TechReqt" node, which he edits in the course of the event, triggered by his verbal observations.

Knowledge. He demonstrates the knowledge of highlighting nodes to draw participant attention to them, making it clear which item he's talking about, which item is significant

at that moment. With his abrupt verbal transition at the end of the event, he also demonstrates the knowledge of how much time to give to the sort of discussion he and Shannon have during the event, i.e. how much to interrogate or expand any given subtopic within the time constraints of the particular session.

Communication. Simon and Shannon carry on one of their most expansive one-on-one conversations of the day's session in this event. Simon's verbal articulation of the rationale for the "TechReqt" node gives rise to a refinement of the node label, in a sort of thinking-through-talking manner.

Tool/Artifact Use. Simon's editing and refinement of the node's label gives a clearer articulation of the technical requirement it voices.

Skills/Expertise. No particular skills evidenced in this event, beside the clearer statement and better specificity Simon adds in his editing of the node label.

Aesthetics. This event demonstrates only a sort of "textual aesthetics" in Simon's recrafting/rewording of the label text, to make it clearer and more specific ("link voice annotations and photos" becomes "link locations, voice annotations, and images").

Ethics. Simon chooses to end the episode rather abruptly, but this is driven by his balancing of the value of further discussion of the specific point with the need to conclude the day's session and generate the web export and other materials for subsequent use.

3.3.6 Summary

In the three episodes described in this document, the hypermedia practitioner (Simon) plays a variety of roles with respect to the participants, subject matter, and Compendium representation. At times he listens to and "captures" things the participants say, at other times he acts as a co-participant, working through the same sensemaking problems the participants face (albeit with different tools and methods), and at other times he works autonomously, disconnected (at least temporarily and partially) from the activities and conversational concerns of the participants. At times he creates new materials, at other times he refines materials already created.

The episodes I analyze mainly concern the issues and ideas that come up around the consideration of a single piece of science data – an image taken by a camera on the Boudreaux robotic rover, and more specifically the lack of complete metadata accompanying that image when it was brought into the Compendium representation. During the course of the episodes, the participants and practitioner attempt to locate the missing information, consider what its absence might stem from, weigh the implications for the current toolset and process that the RST and Hab crew are using as well as for future evolution of those tools and methods, and finally consider how best to express the concerns and implications in summary form for future consideration, all in an atmosphere of time constraints and multiple, competing concerns.

3.3.7 Discussion

My future analytical work will be to try to consider in what ways the categories used in this document need to be restated or recombined, since the boundaries between them are so fluid and poorly (or at least not clearly) defined. In particular the categories of "knowledge," "tool/artifact use," "skills/expertise," and "aesthetics" seem to blend into one another, different categories overlapping depending on the context (e.g. comments made about "tool/artifact use" in one event might more usefully be described as "aesthetics", and so forth). The particular comments I've made in these sections, at times, seem partially contrived, or at least somewhat shoe-horned into the particular categories, although at other times the categories do seem to provide useful distinctions, and my comments a good "fit."

The level of granularity here also may or may not end up being useful. The critical incident analysis uses a higher-power magnifying glass on practitioner choice and action than that used in the earlier grounded theory analysis of this same session. In that analysis, I rendered a move-by-move analysis of the entire 6 May RST session into an analytical table composed of 1300 rows and 19 columns. In the critical incident analysis, I've taken what were 132 of those rows and blown them out into a 50-page closer analysis. I have questions about the scalability of this approach (it is very time-consuming), but even more about whether this is the most generative level of granularity for a meaningful analysis of practitioner choice, aesthetics and ethics. I felt it was necessary to do this at least once, in part because it hadn't been done before that I could find (at least in the context of participatory hypermedia creation), and doing it has certainly exercised my ability to do close analysis and write about it in some coherent form. I am not sure, though, that the level of insight it generated is worth the amount of effort it took. The same comment and concern applies to the grounded theory analysis.

Although I do believe this analysis was a necessary first step, I am not satisfied with the degree to which I was able to "penetrate" my core issues of aesthetic and ethical choice. To some degree this may be because the analysis here is too broad; by attempting to touch on as many dimensions as I do here, I don't go deeply enough on any of them. Some aspects of what I expected to cover here, such as the "narrative" dimensions of practitioner actions, are barely mentioned. I also don't sufficiently describe what might be called "thinking/acting hypertextually," or "hyperpractice" – the meanings of the specifically hypertextual actions Simon takes in the episodes, such as linking and (even more) transcluding, although they are at least partially discussed.

Turning to the under-reported narrative dimension for a moment, the episodes and events I describe in this document could be characterized more closely from the perspective of the various dimensions of "story" creation and leveraging. The participants and practitioner both live inside of and help to create and extend these stories (partially described in the "context" section of this report; see section 3.2.2) by their actions in this session. In some ways Simon creates new story elements in his work here; in some ways he bridges on to the existing ones, often seeming to pick them out of the ether surrounding the particular discussions and material the group is considering at the moment. Something he hears or sees (or "touches" on the maps) connects to one of the

stories. The analysis could focus on what matters and in what ways, dealing with the temporality and sequentiality of the events and how they build on one another.

There were other roads not taken here. I would like to have done more work on characterizing the quality of the engagement between practitioner and participants and the meaning of the various focus modes. In my initial planning for this analysis I had thought about constructing maps or diagrams of such things as all the person-person and person-tool-artifact relationships at work in the session; the various roles the different people play and how those roles relate to one another; the artifacts (resources) themselves, the objects those artifacts contain, and the expected vs. actual use of those objects and artifacts during the session; detailed "histories" of each node and link created and evolved throughout the session, (e.g. each node's labels, tags, links, transclusions, and movements); and other aspects. Indeed the number of possible aspects to analyze seems infinite. In the end I stuck with the framework that's contained here, more out of time limitations than anything else, but also because I could not necessarily see the generative value of doing all the work necessary to create all these other artifacts.

Nonetheless I will make some preliminary comments about what I've learned.

Capturing and characterizing skilled practitioner actions along aesthetic and ethical lines is not a matter of depicting the seamlessness, perfection, or mastery of those actions, although the actions do at times rise to that level. Even using the terms "artistry" and "expertise" seem to imply a closed state, a sense of effortlessness or exaltedness, whereas, as is quite clear in this report, practitioner actions in real-time participatory hypermedia sessions are full of trade-offs, struggles, imperfections, and incompleteness, even at the highly elevated level of skill and sensitivity that Simon demonstrates. Characterizing practice, should not be about saying how perfect or seamless it is, but rather about simply describing *what* it is, what decisions are being made, what consequences those decisions have. It is not yet clear to me what connections doing this has with classical aesthetic analysis, which does seem to impart a sense of closed-ness to its objects – that is, that the artist has achieved some sort of complete perfection, and the object of analysis is to describe and evoke that completeness.[13]

My research is not about exalting or enshrining expert practice, but rather about characterizing or understanding it. As such it runs the risk of not measuring up to some sort of "artistic" standard or expectation that true artistry or expertise means achieving an unproblematic state. It is truer that the problems move to different levels – that is, novices or practitioners of less skill than Simon demonstrates here struggle more in carrying out particular operations, getting "stuck" on logistical or technical problems, and so forth, whereas Simon is able to perform spontaneously-conceived and complex actions extremely rapidly. His "problems" are more to do with managing the multiplicity of possible actions and dealing with time constraints. That is, this research may be more

---

[13] This is, of course, not the case for many recent artists, particularly 20th century avant-garde artists whose work explicitly concerns partialness, indeterminacy, and similar matters.

about dealing with situations where experts are challenged – where sensemaking, spontaneously arising problems, imperfections, constraints, lack of resources and fully shared understanding between participants are the subjects of concern, rather than achievement of closed perfection or expressive faultlessness. To frame expert practice as a "problem" does not take away from its achievement in particular contexts. Rather – hopefully – it gives more realism to the analysis. There can be moments of genius and inspiration even in an "incomplete" effort. Such transcendent moments, particularly in a practice of such inherent difficulty as constructing participatory hypermedia representations in real time, come against a backdrop of struggle, blocks, gaps, doubts, "brain-freeze"[14] etc. It doesn't take away from the achievement or value to say so; it just acknowledges what the reality is. Any given effort could be assessed in terms of what proportion of high value to low value, artistry to quotidian, etc. Moments of transcendence are possible and do occur, but they are not the sum total (even if sometimes they are a higher proportion of an event's total than others).

---

[14] From a descriptive comment Simon Buckingham Shum made to me about his facilitative performance during the November 2004 JTFCOM experiment in Norfolk, VA.

3.4   *Conclusion*

In this chapter, I've described a sequence of trial approaches to empirical work, experiments and analyses that have collectively helped me to refine my research questions, get a better understanding of the timing, risks and yields of different methods, and develop insights that have led to a tightening of my conceptual framework and a clear idea of how best to proceed in my remaining doctoral studies (which will be outlined in the following chapter).

I started with explorations of ways that I might take an action research approach to working with a group of people in creating hypermedia artifacts, incorporating aesthetics and narrative into representations of a problem situation. While these forays were generative, they raised a number of "red flags" in terms of potential risks for my research, such as finding a suitable set of subjects, conducting the project in such a way that maintained focus on my research questions even if the needs of the subject group diverged from those, and justifying an action research approach. When I turned to employing grounded theory and critical incident methods in the close study of *in situ* PHC practice, I felt I had found an approach that still allowed me to get deeply into my research questions without the risks of the action research approach. The analysis reported in sections 3.2 and 3.3 took me quite far indeed into the kind of close observation and interpretation that will allow me to construct the kind of characterization of expert PHC practice that rises to the levels I outlined in the Literature Review chapter.

The next chapter provides a plan for how I will repeat and deepen the empirical work I've already conducted, leading to the construction of a dissertation on the issues covered in this and the Literature Review chapter.

4 Proposal

This chapter provides an overview of how I intend to spend the remainder of my doctoral program at KMi, including a summary of intended research contributions and a plan of action.

In the Literature Review chapter, I argued for an orientation to PHC practice that centers on aesthetics, improvisation, sensemaking, narrative, and ethics. This was motivated both by my reading of the literature as well as by the substantive empirical work I conducted in my first year of doctoral study, which itself was informed by my years of professional experience with, and observation of, the practice.

The Practical Report chapter described a prototype methodology (sections 3.2 and 3.3), which provides the basis for the approach I propose to take in years 2 and 3. It appears to be both manageable in terms of risks and generative in terms of my primary research interests.

Since the previous chapters already supply much explanation of the approach I propose to take, this chapter will add specifics of how I intend to apply the methodology to other cases, deepen the analysis, and test the generalizability, leading to the writing of the dissertation.

4.1 *Primary contributions*

This research will produce the following immediate contributions (I discuss a broader set of possible contributions in section 4.5 below).

- **A survey and critical review of the primary literature** (where are contributions, where are gaps). As discussed further in section 4.4 below, I will continue the analysis begun in the Literature Review chapter, locating the analysis and contribution I intend to make in the related work.

- **A language for characterizing expert practice in participatory hypermedia construction, including a taxonomy of concepts**. As begun in the work described in the Practical Report chapter, I will provide an explanatory framework that can be used for similar analyses of PHC and analogous practices.

- **Validation of the language and taxonomy against ethnographic observation of in situ practice**. As described further below, my research will include validation of the explanatory framework with my research subjects.

- **Extend the work of researchers looking at analogous practices**. Researchers such as Aakhus, Sawyer, Yoong, Seddon and others have taken similar approaches to those I propose. In their work analyzing analogous practices, such as dispute mediation, GSS facilitation, teaching, and improvisational music and theater, they have employed various qualitative methods and touched on the

central aspects of my conceptual framework. My research will extend their work not only by applying their approaches to a different practice (PHC), but by a unique combination of research methods and key conceptual elements (aesthetics, ethics, improvisation, narrative, and sensemaking) in the observation of expert practice.

4.2 Proposed plan

This section provides a proposed plan for the remaining two years of my doctoral program at KMi. The plan comprises four main elements:

- an iterative cycle of close analyses of *in situ* PHC and analogous practice, combining grounded theory, critical incident analysis, and validation of both with participants and subjects (following Seddon's idea of "member checks" (2005))
- evolution of a taxonomy of concepts characterizing the aesthetic, ethical, improvisational, sensemaking, and narrative elements of PHC practice
- ongoing literature review (described in section 4.4 below)
- writing of the dissertation

The plan commences on acceptance of this report and concludes in January 2008 (continuing part-time study). It proceeds in two main sections: field research and writing.

4.2.1   Overview of plan

The chart in Figure 32 summarizes the plan I propose to follow.

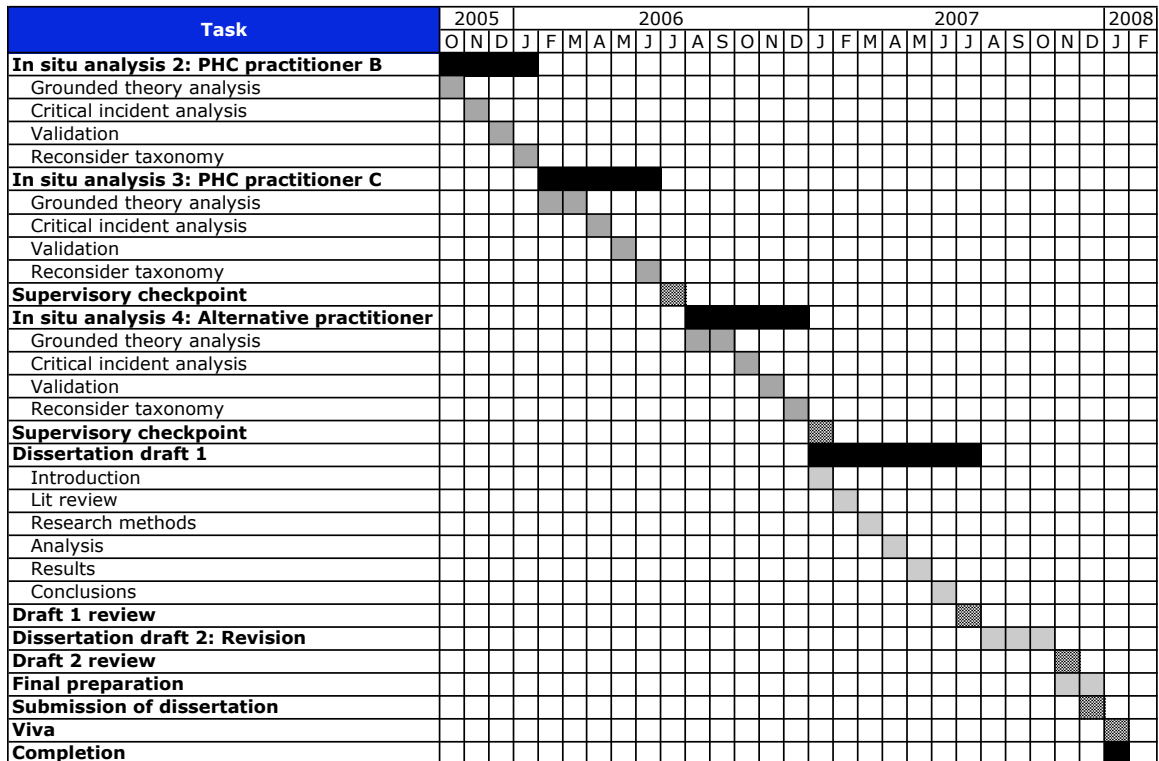| Task	2005 O	N	D	2006 J	F	M	A	M	J	J	A	S	O	N	D	2007 J	F	M	A	M	J	J	A	S	O	N	D	2008 J	F
In situ analysis 2: PHC practitioner B	█	█	█																										
Grounded theory analysis	▒																												
Critical incident analysis		▒																											
Validation			▒																										
Reconsider taxonomy				▒																									
In situ analysis 3: PHC practitioner C					█	█	█	█																					
Grounded theory analysis					▒																								
Critical incident analysis						▒																							
Validation							▒																						
Reconsider taxonomy								▒																					
Supervisory checkpoint									▚																				
In situ analysis 4: Alternative practitioner											█	█	█																
Grounded theory analysis											▒																		
Critical incident analysis												▒																	
Validation													▒																
Reconsider taxonomy														▒															
Supervisory checkpoint															▚														
Dissertation draft 1																█	█	█	█	█	█								
Introduction																▒													
Lit review																	▒												
Research methods																		▒											
Analysis																			▒										
Results																				▒									
Conclusions																					▒								
Draft 1 review																						▚							
Dissertation draft 2: Revision																							▒	▒					
Draft 2 review																									▚				
Final preparation																										▒			
Submission of dissertation																											▚		
Viva																												▚	
Completion																													█

Figure 32: Gantt chart of research plan

4.2.2　Field research

For the remainder of 2005 until the end of 2006, I will engage in three iterative cycles of close analysis of practice (counting the cycle I've already completed, this will bring my number of research subjects to four). Each will comprise an initial grounded theory analysis of an audio and screen recording of a different practitioner working with a different group of participants. The output of this analysis will be an annotated spreadsheet transcript analyzing each practitioner move according to the taxonomy of concepts and categories derived from the previous cycle. Following this, I'll select a set of critical incidents from within the analyzed session that highlight episodes of particular interest (for example, key dilemmatic moments in the session), and subject them to a closer analysis. After this is completed, I'll validate my analysis with both practitioner and participants. Following that, I will revisit and update the taxonomy of concepts and categories, documenting any changes, additions, or deletions.

The first two of these three cycles will focus on two different PHC practitioners. I already have the audio/screen video recordings in hand.

Event	In situ analysis 2: PHC practitioner B			
Method	Grounded theory	Critical incident	Validation	Reconsideration of taxonomy
Finished	1-Oct-05	1-Dec-05	15-Dec-05	15-Jan-06

Event	In situ analysis 3: PHC practitioner C			
Method	Grounded theory	Critical incident	Validation	Reconsideration of taxonomy
Finished	15-Mar-06	15-May-06	31-May-06	30-Jun-06

At the conclusion of these two analyses, I will visit KMi for a supervisory checkpoint, presenting my results to date. This will occur in July 2006. Following that, I'll perform the final round of practitioner analysis.

Event	In situ analysis 4: Non-PHC practitioner			
Method	Grounded theory	Critical incident	Validation	Reconsideration of taxonomy
Finished	31-Aug-06	31-Oct-06	15-Nov-06	15-Dec-06

While the previous rounds consisted of close analysis of PHC practitioners working in the field, the final round will be different. In this round, I'll observe a practitioner employing a non-PHC, and probably a non-software-assisted, facilitation approach. I will, however, employ the same data collection and analysis procedures. This is for several reasons:

- to triangulate the analytical approach by applying it to a different sort of subject
- to gain additional insight by being able to reflect on how consideration of a different expert practice sheds light on the observations of PHC practice

At the conclusion of these four rounds of field research, I will visit KMi for a supervisory checkpoint, presenting my results to date. This will occur in January 2007.

4.2.3 Writing

From January 30 to July 31 of 2007, I'll prepare the first draft of the dissertation, according to the following schedule:

Event	Dissertation draft 1: Introduction	Dissertation draft 1: Lit review	Dissertation draft 1: Research methods	Dissertation draft 1: Analysis	Dissertation draft 1: Results	Dissertation draft 1: Conclusions
Method	Writing	Writing	Writing	Writing	Writing	Writing
Finished	28-Feb-07	31-Mar-07	30-Apr-07	30-May-07	30-Jun-07	31-Jul-07

Allowing a month and a half for supervisory review of this draft, I'll then visit KMi for review meetings in August 2007. Following this, I'll revise and prepare the second draft, submitting it October 15, 2007. Allowing a month of supervisory review, I'll then have a teleconference review meeting on November 15, 2008.

Following this, I will prepare the final version of the dissertation and submit via mail December 15, 2008. Allowing a month for committee review, I will visit KMi for the viva January 15, 2008.

Event	Dissertation draft 2: Revision	Draft 2 review	Final preparation	Submission of dissertation	Viva
Method	Writing	Teleconference	Writing	Mail paper copies	KMi visit
Finished	15-Oct-07	15-Nov-07	15-Dec-07	15-Dec-07	15-Jan-08

4.3 Risk assessment

This section describes potential risks to the above plan, and how I will mitigate them.

Technical	There are few technical risks. The data collection and analysis I'll perform require conventional software that I already have in hand.
Financial	Financial risks to KMi or myself are low. There are possibly some mailing and media costs associated with gathering audio/screen recordings from remote practitioners. There is of course some risk that my employer will not continue to fund my tuition and travel costs, but I will endeavour to avoid unemployment.
Operational	As with any schedule, the above plan is subject to unknown contingencies. My estimation of the time involved for each step is based on the experience I gained from October 2003 to the present. If the initial phases of the plan do not go according to schedule, I will revisit and reformulate the remaining stages. However, the plan described above has me finishing well within the ostensible three full-time years of study (which would end October 2009), so there is room to expand if necessary.
Geographic	As has been the case since October 2003, I am geographically separated from my primary supervisor, Simon Buckingham Shum, and the other faculty members of KMi. This has not proven to be an obstacle to date, since we are in good email, instant messaging, telephone and web conference contact. I expect that this situation will continue. Similarly, while I may not be geographically co-located with my research subjects, working from screen and audio recordings of sessions (such as those produced by the Camtasia software tool) has proven to be an effective data collection mechanism. Also, I have a good working relationship with my local adviser, Dr. Foster Provost, New York University.
Time	As has been the case since October 2003, I am pursuing a part-time external research degree from KMi, fitting in my research activities with a regular full-time job. Although this has certainly been a challenge and will no doubt continue to be, I have been able to find time in the evenings, weekends, and early mornings and I believe my productivity has been sufficient. Barring a radical change in my time commitments at work, I expect this situation to continue.
Resources	I believe we still have to identify some of the members of my extended committee; otherwise, all the roles have been filled. I have sufficient computing and other tool resources.
Legal	No foreseen legal risks for this research. However, I will probably need to ask my research subjects to sign some sort of agreement.
Political	No foreseen political risks for this research.

4.4 Plans for literature review over the next two years

The Literature Review chapter traced the main themes that have informed my research since October 2003, focusing on the key concepts of aesthetics, ethics, sensemaking, narrative, and improvisation, and summarizing related work in the hypermedia and CSCW literature. Over the next two years, I will complete the analysis by examining work covering analogous practices and theoretical lenses in greater detail than presented here. Some highlights of this plan are discussed below.

I will better locate the idea of *participatory hypermedia construction* in the literature. I'll first define hypermedia construction then join it with the concept of participatory design and show the points of connection in the literature – where hypermedia tools have been used in groups as part of some sort of participatory effort.

I will examine conceptions of expert practice, and methods of studying and characterizing the work of expert practitioners, particularly the aesthetic and ethical dimensions of such practice (especially those professional practices that involve working with communicative interchanges between people). Tying together the above concepts, I'll look at a number of analogous practices and research that has characterized the role of the expert practitioner within the practices.

After examining a number of these practices, which mainly exist at something of a remove from PHC practice, I'll tighten the focus to look at two whose research literature comes closest to the heart of the matter – the work for Group Support Systems facilitators, and the practice of what is called aesthetic mediation. Both have to do with the expert shaping of dense representational artifacts for groups in real time. A critique of the current GSS facilitator research will help put the current analysis into sharper focus.

As a first step, I've constructed a table that shows the ways key literatures intersect with my research themes. For each thematic category, I will list representative authors and show (if and) how that category addresses the ideas of practitioner aesthetics, improvisation, narrative, sensemaking, and ethics.

Literature theme	Representative Authors	Aesthetics	Improvisation	Narrative	Sensemaking	Ethics
"Technocratic" GSS facilitator research	Anson Bostrom Clawson Yoong					
"Design" GSS facilitator research	Aakhus					
Reflective practitioner	Schön					
Aesthetic mediation	Cohen Lovelace					

Literature theme	Representative Authors	Aesthetics	Improvisation	Narrative	Sensemaking	Ethics
	Palus					
Bricoleur/ boundary-spanner (CSCW)	Orlikowski Levina Bannon					
(Transformative) Dispute mediation	Aakhus Bush & Folger					
Social informatics	Kling					
Hypermedia narrative	Barnes Landow Emmet & Cleland					
Participatory design	Greenbaum Kyng					
Performance creativity	Sawyer					
Argumentation	Conklin Buckingham Shum					
Professional expertise	Petre Cross					
Media / cultural studies	Voithofer Ellsworth					
Sensemaking	Dervin Weick					
Narrative theory	Bruner					
Concept maps	Novak					

4.5   *Conclusion: areas for future research*

This section outlines some possible future directions and possible contributions my research can make.

4.5.1   Hypermedia technology and tool use

There are few accounts of participatory construction of hypermedia artifacts in the literature. For that matter, there are few accounts of the process of construction of hypermedia artifacts of any sort, let alone participatory ones. Such accounts would examine what is currently left largely tacit in hypermedia practice and make it more explicit and tangible. My research aims to do so by applying constructs from other disciplines that address the dimensions of central interest. There are a number of issues in classic hypertext literature that this research may address, such as improving groups' ability to capture and formalize design rationale and related knowledge management concepts as explored in Conklin et al (2001)

> representing, codifying and manipulating semiformal concepts, the use of formalisms to mediate collective sensemaking, and the construction of group memory…. fostering 'hypertext literacy' in real working environments.

By querying understudied dimensions of hypermedia practice such as aesthetics and improvisation, my research may help to illuminate technological support needs not imagined yet (Bertelsen & Pold, 2002). By focusing on the individual moves practitioners make and attempting to paint a holistic picture of the meaning and nuances of such moves in the dimensions of interest, this research may help open up the conception of what kinds of moves (and tools) are possible (Aakhus, 2003) and move away from the "normality" ascribed to hypermedia practice in conventional, received understandings now, so that expert use of the tools can become more integrated into well-understood practices. By doing so, it will help to expand notions of hypermedia's "reach" beyond the bounds of what Marshall (2001) describes as "intellectual work" (with its implied emphasis on pursuits such as creating scholarly archives or collections of codified organizational knowledge).

4.5.2   Practitioner training and professional development

This research may help develop better training and professional development concepts, methods, and tools for PHC practitioners and those of analogous practices. This has been a difficult subject over the years for a variety of reasons. The breadth and combination of skills required (group process facilitation, rapid hypermedia software manipulation, facility with conceptual modeling frameworks) is relatively rare, and partially because the expertise itself is not well enough understood to develop effective training from (Yoong & Pauleen, 2004). By providing ways to characterize the aesthetics and ethics of expert PHC practice, this research may help novice and even experienced practitioners become more intentional and reflective in their practices. Following Sawyer's recommendations for the professional development of teachers which emphasize the creative and improvisational aspects of teaching (Sawyer, 2004), illuminating the improvisational aspects of PHC practice may lead to the development of training curricula that enable

practitioners to become more participant-centered, and to both ask and solicit more "higher-ordered" questions (Sawyer, 2004: 18). An emphasis on the "ensemble" aspects of improvisation – the ways in which participant and practitioner collaborate in dilemmatic moments– may lead to a better understanding of the "collective learning" that can take place, and how to bring it about. By performing "close empirical studies of the discourse processes of collaboration" in this context, my research can help attain "deeper understanding," which can lead to "brighter, more motivated, and more effective" practitioners. By emphasizing and highlighting the improvisational aspects of PHC practice, this research can lead to ways to aid practitioners in their progress from novice to expert:

> Beginning teachers need routines, but also need to learn how to flexibly apply them. Research has shown that experienced teachers have a larger repertoire of automatized routines than novices, but also that they can modify them to improvisationally respond to each classroom's unique needs … Borrowing a page from scripted instruction, beginning teachers could be explicitly provided with a set of routines; but in creative teaching, those routines would be designed to allow variation and embellishment. (Sawyer, 2004: 18)

The study of "disciplined improvisation" can help practitioners learn to discern when to stick to routines and to gauge the scope and scale of their improvisation:

> Disciplined improvisation provides us with a way to conceptualize creative teaching within curricular structures. The improvisation metaphor allows us to frame more sophisticated questions; rather than "script or no script?" the metaphor leads us to ask: (a) What sorts of guiding structures are appropriate in what kinds of settings and subjects? (b) How can teachers learn to improvise effectively within structures? and (c) When should teachers stick with the script, and when should they improvise creatively? (Sawyer, 2004)

By focusing on the artful crafting that can be observed in the actions that expert practitioners take at sensemaking moments, this research can extend Aakhus' work by highlighting the "design stance" (vs. a "technocratic" approach) of GSS facilitators. This can help build the "community of expertise" by highlighting practices that are already there:

> Such studies could document what practitioners do in dilemmatic situations which could be used to foster the communicative imagination of practitioners and refocus professional development. (Aakhus, 2001: 364)

4.5.3 Development of transformative practice

On a broader social level, I believe that development of expertise in practices like PHC can become an essential societal skill in a world characterized by multiple and competing perspectives, fragmentation of discourse and social cohesion, and discontinuous change. The aim of the practice itself is to aid communication across difference, in compressed and stressful times and spaces, where parties approach issues from different positions,

imperatives, and points of view, without the comforting discursive assumptions of like minds, free attention, communicative competence, and ability to listen. Practitioner competence helps construct coherence, creating a space for the type of multi-level communication that looks both forward and backward in time, while caring for the needs and exigencies of the present moment.

Researchers in many disciplines have applied the term "transformative" to practices that seek to shift the ways in which parties (clients, disputants, patients, etc.) approach situations, each other, and their own relationships to and perspectives on a situation, rather than focusing only on "fixing" the situation itself. For example, Bush and Folger define their transformative mediation approach as a practice that

> emphasizes mediation's capacity for fostering empowerment and recognition… transformative mediators concentrate on empowering parties to define issues and decide settlement terms for themselves and in helping parties to better understand one another's perspectives… transformative mediation helps parties recognize and exploit the opportunities for moral growth inherently presented by conflict. (Bush and Folger, 1994:12)

Similarly, Cohen (1997:64) quotes Louise Diamond describing a transformative approach to conflict resolution:

> Transforming conflict is different from managing or resolving conflict. To transform conflict is to work systemically to change the very assumptions, beliefs and perceptions of the parties in conflict, as well as to open the doors to creative solutions and new behaviors. To transform conflict is to deal with the root issues and needs being expressed in the conflict situation, not just to bridge different positions (quoting Louise Diamond (Diamond, L. (1994). Beyond win/win: The heroic journey of conflict transformation. Washington, DC: Institute for Multi-track Diplomacy.)

This research can be a step in the direction of harnessing the transformative potential of hypermedia, for example by helping people to construct and navigate representations of their problems that emphasize the relationships between ideas, issues, and perspectives, enabling hypermedia to serve as the "something in the middle" (Palus & Drath, 2001) that mediates between members of a group as well as between the group and their task or subject matter. Hypermedia could serve the purpose of enhancing (or creating) dialogue (Isaacs, 1999):

> a process which occurs by putting meanings to be explored and re-constructed in the middle of a group. Placing a mediating object in the middle, under the right conditions, is a way to enhance the experience of dialogue. (Palus & Drath, 2001).

Practitioners must have heightened sensitivity to and awareness of the meanings and effects of their actions of their relationships to participants, subject matter, representation, and tools. This research can make a contribution in that direction by revealing what

practitioner actions and relationships *can* mean in particular situations. By illuminating these aspects, the research may help expert practitioners improve their transformative efficacy in both aesthetic and ethical dimensions, through enabling reflective practice. Developing these dimensions of practice may help practitioners as well as groups attain a superlative set of skills, summarized by Wilber's characterization of "vision-logic":

> The point is to place each proposition alongside numerous others so as to be able to see, or "to vision", how the truth or falsity of any one proposition would affect the truth or falsity of the others. Such panoramic or vision-logic apprehends a mass network of ideas, how they influence each other, what their relationships are. It is thus the beginning of truly higher-order synthesizing capacity, of making connections, relating truths, coordinating ideas, integrating concepts… a system or totality of truth-seeing at a single view; the relation of idea with idea, of truth with truth. (Wilber, 2000:249)

4.5.4   Contributions to 'Practice as Research'

PHC is not one of the media generally associated with the Practice as Research school (Piccini, 2003; Sullivan, 2004; Biggs, 2005; Scrivener, 2000). But the improvisatory dynamics of practitioner actions in the construction and modification of hypermedia knowledge representations in live settings with groups shares many performative aspects with live theater or musical performances, while engaging many of the same skills, as well as aesthetic and ethical questions, as those involved in film and video construction. This research will surface how, and in what ways, these aspects are similar, or differ, from those in the other PaR media. I will add the perspectives of PARIP researchers to the study of PHC practice, and seek to enrich the discourse of the PaR and PARIP communities by showing how their ideas extend to other sorts of media practice.[15]

4.5.5   Research on GSS facilitation

Of all the fields I have looked into, Group Support Systems research, has the most voluminous literature on topics related to the set I am exploring. This research examines the role, training, actions, and effects of a person facilitating the use of GSS technology. There are many studies looking at how facilitators conceive their role and what skills appear to be related to particular kinds of outcomes (Anson et al, 1995). While there is widespread recognition that "much of what the facilitator does is active, spontaneous and flexible" (Yoong & Pauleen, 2004), for the most part such studies do not address specifically aesthetic, ethical, improvisational, or narrative elements. There has, however, been work examining choices and dilemmas faces by facilitators (Yoong & Gallupe 2002), issues faced by new facilitators that touch on sensemaking and related phenomena (Clawson & Bostrom, 1996), and research that performs move-by-move analysis of practitioner actions, focusing on the "design" choices made by facilitators in the course of practice settings (Aakhus, 2001; Aakhus, 2002; Aakhus, 2004). Writers in this field have developed preliminary guidelines for practice (Yoong & Gallupe 2002) and call for research focusing on more experienced practitioners (as opposed to the novices that much of this body of work have focused on (Yoong & Gallupe 2002). My research will extend

---

[15] This conversation was opened recently by Selvin and Buckingham Shum (2005).

this work by focusing explicitly on how the element of interest can be observed and analyzed in instances of a GSS-like practice, and extend some of the constructs derived from GSS research to another technology (participatory hypermedia).

4.5.6   Contributions to "e-facilitation" and virtual team research

Bridging onto GSS research, a topic of growing interest is the issues and methods surrounding facilitation of virtual teams:

> As experienced electronic meeting facilitators increasingly support dispersed or virtual meetings, it will become increasingly important to understand how to achieve and maintain coherence. (Yoong & Gallupe, 2002)

The newness of the field, and the combination of skills it requires, has led to a lack of guidelines, best practices, and experienced practitioners; "researchers and less-experienced practitioners continue to struggle to understand the subtleties and difficulties in the application of meeting facilitation techniques in an electronic context" (Yoong & Pauleen, 2004). By looking deeply at PHC practitioner expertise in virtual meetings, my research can both contribute insights as to how participatory hypermedia can be a resource for e-facilitation, and can shed light on dynamics of such facilitation that have been understudied in the literature to date.

5   References

Aakhus, M. (2001). Technocratic and Design Stances Toward Communication Expertise: How GDSS Facilitators Understand Their Work. *Journal of Applied Communication Research*, Volume 29, Number 4 / November 2001.

Aakhus, M. (2002). Design practice and transparency work in the technological facilitation of collaborative decision making. Unpublished manuscript.

Aakhus, M. (2003). Neither Naïve nor Critical Reconstruction: Dispute Mediators, Impasse, and the Design of Argumentation. *Argumentation* 17: 265-290.

Aakhus, M. (2004). Understanding the Socio-Technical Gap: A Case of GDSS Facilitation. In G. Goldkuhl, M. Lind, & S. Cronholm (Eds.), *Proceedings of the 2d International Conference on Action in Language, Organisations, and Information Systems* (pp. 137-148). Linköping, Sweden: Research Network VITS.

Alvarez, J. & Merchan, C. (1992). Narrative Fiction and Imagination for Action, *International Studies of Management and Organization*, Vol. 22, No. 3, pp 27-45 M.E. Sharpe, Inc.

Anson, R., Bostrom, R., and Wynne, B. (1995). An Experiment Assessing Group Support System and Facilitator Effects on Meeting Outcomes. *Management Science*, 41 (2),189-208.

Arnheim, R. (1967) *Art And Visual Perception: A Psychology of the Creative Eye*. Berkeley And Los Angeles: University of California Press.

Barnes, S. (1994). Hypertext Literacy. In *Interpersonal Computing and Technology*, 2 (4): 24-36, Available online at http://www.emoderators.com/ipct-j/1994/n4/barnes.txt.

Benjamin, R. (2001). Mediation As Theater And Negotiation As Performance Art. This article was first published in the ACR (Association for Conflict Resolution) Family Section Newsletter, Fall, 2001. Found online at http://www.mediation.nl/pdf-documenten/MediationAsTheatre.pdf

Bertelsen, O. & Pold, S. Towards the Aesthetics of Human-Computer Interaction. In Frøkjær, E. & Hornbæk, K., Eds., *Proceedings of the Second Danish Human-Computer Interaction Research Symposium*, Department of Computer Science, University of Copenhagen, November 2002.

Biggs, M. A. (2003). The Rôle of 'the Work' in Research. *Proceedings* of PARIP 2003, available online at http://www.bris.ac.uk/parip/biggs.htm.

Biggs, M. A. (2005). *Research into practice conference* (website for conference proceedings). Available online at http://www.herts.ac.uk/artdes1/research/res2prac/

Boal, A. (1979) *Theater of the Oppressed*. Urizen Books: New York.

Boje, D.M. (1991) Organizations as Storytelling Networks: A Study of Story Performance in an Office-Supply Firm. *Administrative Science Quarterly*, Vol. 36, 1991: 106-126

Bolstrom and Heinen, 1977b (Kling)

Bostrom, R.P., Anson, R., Clawson, V.K. (1993). 'Group Facilitation and Group Support Systems'. *Group Support Systems: New Perspectives*, Macmillan, 146-148.

Bourdieu, P., Wacquant, L. (1992). *An Invitation to Reflexive Sociology*. Chicago: Chicago University Press. Cited in Levina (2001).

Bromme, R. & Stahl, E., Eds. (2002). *Writing Hypertext and Learning: Conceptual and Empirical Approaches*. London, Pergamon.

Brooks, M. (2000). "The Lived Experience Of Making A Life Drawing: Drawing Amy". Undated. Available online at http://www.phenomenologyonline.com/articles/brooks.html

Bruner, J. (1990). *Acts of Meaning*. Harvard University Press, Cambridge.

Bruner, J. (1991). The Narrative Construction of Reality. *Critical Inquiry*, Autumn 1991 Chicago, University of Chicago Press.

Buckingham Shum, S. (1996). Analyzing the Usability of a Design Rationale Notation, in T. Moran and J. Carroll, eds., *Design Rationale: Concepts, Techniques, and Use*. Mahwah: Lawrence Erlbaum.

Buckingham Shum, S., MacLean, A., Bellotti, V., Hammond, N. (1996). Graphical Argumentation & Design Cognition. *Technical Report KMI-TR-25*, Knowledge Media Institute, The Open University, U.K.

Burton, J. (Ed.). (1990). *Conflict: Human needs theory*. Acknowledgment and introduction. New York: Macmillan.

Bush, R., Folger, J. (1994). *The Promise of Mediation: The Transformative Approach to Conflict*. Jossey-Bass Publishers, San Francisco.

Carr, C. (2003). Using Computer Supported Argument Visualization to Teach Legal Argumentation. In Kirschner, P., Buckingham Shum, S., & Carr, C. *Visualizing Argumentation: Software Tools for Collaborative and Educational Sense-making*. Springer-Verlag, London.

Carmel, E., Whitaker, R., George, J. (1993). PD and joint application design: A transatlantic comparison. *Communications of the ACM* (June) 36(6):40-48. Cited in Kling (1999).

Cassell, C. and Symon, G. (1994). Qualitative research in work contexts. In Cassell, C. and Symon, G. (eds.) *Qualitative methods in organisational research*. London: Sage, 1-13. Cited in Sankaran (2001).

Christians, C. G. and Carey, J. W. (1981). The Logic and Aims of Qualitative Research. in Stempel, G. and Westley, B., Eds., *Research Methods in Mass Communication*. 2nd ed. Englewood Cliffs: Prentice Hall.

Clancey, W., Sierhuis, M., Alena, R., Berrios, D., Dowding, J., Graham, J., Tyree, K., Hirsh, R., Garry, W., Semple, A., Buckingham Shum, S., Shadbolt, N., Rupert, S. (2005). Automating CapCom Using Mobile Agents and Robotic Assistants. In *Proceedings of the American Institute of Aeronautics and Astronautics 1st Space Exploration Conference*, 31 Jan - 1 Feb, 2005.

Clawson, V. (1992). *The Role of the Facilitator in Computer-Supported Environments*, unpublished doctoral dissertation, Walden University, cited in Yoong & Gallupe, 2002.

Clawson, V., Bostrom, R.. (1996). Research-Driven Facilitation Training for Computer-Supported Environments, *Group Decision and Negotiation* 5(1), 7-30.

Cohen, C. (1997). *A Poetics of Reconciliation: The Aesthetic Mediation of Conflict*. Unpublished PhD dissertation, University of New Hampshire, December 1997. Available online at www.brandeis.edu/ethics/coexistence_initiative/research_and_scholarship/reconciliation.pdf

Conklin, J. (1987). Hypertext: An Introduction and Survey. In *IEEE Computer* 20 (9).

Conklin, J.,. Begeman, M. (1988). gIBIS: A Tool for Exploratory Policy Discussion. In *Proceedings of CSCW '88*.

Conklin, E. J., & Burgess Yakemovich, K. C. (1991). A Process-Oriented Approach to Design Rationale. *Human-Computer Interaction*, 6(3,4), 357-391.

Conklin, E. J., & Burgess Yakemovich, K. C., A Process-Oriented Approach to Design Rationale, in T. Moran and J. Carroll, eds., *Design Rationale: Concepts, Techniques, and Use*. Mahwah: Lawrence Erlbaum.

Conklin, J., Selvin, A., Buckingham Shum, S., Sierhuis, M. Facilitated Hypertext for Collective Sensemaking (2001). 15 Years On From gIBIS. In *Proceedings of the twelfth ACM conference on Hypertext and Hypermedia*. ACM Press, New York.

Conklin, J. (2001). The Dialog Mapping Experience. Chapter 1 of Dialog Mapping: Making Sense of Project Fragmentation, forthcoming. Available online at http://cognexus.org/dmepaper.htm.

Cross, N. (2003). The expertise of exceptional designers. In N. Cross and E. Edmonds (eds) *Expertise in Design: Design Thinking Research Symposium 6.* University of Technology, Sydney, Australia. ISBN 0-9751533-0-7. Available online at http://research.it.uts.edu.au/creative/design/papers/12CrossDTRS6.pdf.

Davis, W. (1972). *Peirce's epistemology*. The Hague: Martinus Nijhoff.

Dennis, A.R., Haley, B.J., and Vandenberg, R.J. (1996). A Meta-Analysis of Effectiveness, Efficiency, and Participant Satisfaction in Group Support Systems Research. In *Proceedings of the Seventeenth International Conference on Information Systems*, 1996, 278-289

Denzin, N. A. and Lincoln, Y.S. (1994). Introduction: entering the field of qualitative research. In Denzin, N. A. and Lincoln, Y. S. (eds.) *Handbook of qualitative research.* Thousand Oaks: Sage, 1-17.

Dervin, B. (1983). An Overview of Sense-Making Research: Concepts, Methods, and Results To Date. Paper presented at the annual meeting of the International Communication Association, Dallas, TX.

Dewey, J. (1934). *Art as Experience*. Berkley Publishing Group, New York.

Dick, B. (1993). *You want to do an action research thesis?* Available on line at http://www.scu.edu.au/schools/gcm/ar/art/arthesis.html

Dissanayake, E. (1988). *What is Art For?* Seattle: University of Washington Press.

Douglas, A., Scopa, K., Gray, C. (2000). Positioning the Practitioner as Researcher, *Working Papers in Art and Design*, Volume 1, ISSN 1466-4917. Peer-reviewed papers from the Research into Practice conference 2000. Available on line at http://www.herts.ac.uk/artdes1/research/papers/wpades/vol1/douglas2.html

Dowmunt, T. (2003). "mother pictures: an autobiographical video work in progress" PARIP 2003. Available online at http://www.bris.ac.uk/parip/webpaper_dowmunt.pdf

Drath, W. H., & Palus, C. P. (1994). Making common sense: Leadership as meaning-making in a community of practice. Greensboro, NC: Center for Creative Leadership.

Dreir, O. (1993). Re-searching psychotherapeutic practice. In S. Chaiklin & J. Lave, Eds. *Understanding Practice: Perspectives on Activity and Context*. Cambridge University Press, Cambridge.

Eckehard, D., Douglas, S., Kirkpatrick, A., Westerfield, M. (1997). Participatory Design for Widely-Distributed Scientific Communities. In *Proc. 3rd Conference on Human Factors & the Web, Designing for the Web: Practices & Reflections*, June 12, 1997, Denver, Colorado, USA. Available online at http://www.uswest.com/web-conference/proceedings/eck.html. Cited in Kling (1999).

Ellis, J. (2003). Research and the Problem of 'the Industry'. Proceedings of PARIP 2003. Available online at http://www.bris.ac.uk/parip/ellis.htm.

Emmet, L., Cleland, G.(2002). Graphical Notations, Narratives and Persuasion: a Pliant Systems Approach to Hypertext Tool Design. Proceedings of the thirteenth ACM conference on Hypertext and hypermedia. ACM Press, New York.

Ellsworth, E. (1992). Why Doesn't This Feel Empowering? Working Through the Repressive Myths of Critical Pedagogy. In Gore, J. & Luke, C., Eds., *Feminisms and Critical Pedagogy*. Routledge, New York.

Engestrom, Y. (1993). Developmental Studies of Work as a Testbench of Activity Theory. In S. Chaiklin & J. Lave, Eds. *Understanding Practice: Perspectives on Activity and Context*. Cambridge University Press, Cambridge.

Fishwick, P., Diehl, S., Prophet, J., Lowgren, J. (2005). Perspectives in Aesthetic Computing. Accepted for *Leonardo*, MIT Press.

Fischer, G., Lemke, A., McCall, R. and Morch, A. (1996). Making Argumentation Serve Design. In Moran, T., Carroll, J. *Design Rationale: Concepts, Techniques, and Use*. Lawrence Erlbaum, Mahwah.

Fortner, R. S., Christians, C. G. (1981).Separating Wheat from Chaff in Qualitative Studies, in Stempel, G. and Westley, B., Eds., *Research Methods in Mass Communication*. 2nd ed. Englewood Cliffs: Prentice Hall.

Frost, A.,Yarrow, R. (1990). *Improvisation in Drama.* Hampshire: MacMillan Press, quoted in Furnham, D. The Cinema of Comic Illusions. Proceedings of PARIP 2003. Available online at http://www.bris.ac.uk/parip/furnham.htm.

Fountain, J. E. (1999). A Note on the Critical Incident Technique And its Utility as a Tool of Public Management Research. Presented at the panel on qualitative methods, annual meeting of the Association of Public Policy and Management, Washington, D.C., November 4-6, 1999. Available online at http://www.ksg.harvard.edu/prg/fountain/citechnique.pdf

Goffman, E. (1967). *Interaction Ritual*. Pantheon: New York. Cited in Aakhus (2001).

Graham, B. (1997). A study of audience relationships with interactive computer-based visual artworks in gallery settings, through observation, art practice, and curation. Unpublished Ph.D. thesis, University of Sunderland.

Greenbaum, J. & Kyng, M., Eds. (1991). *Design at Work: Cooperative Design of Computer Systems*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Halasz, F. (1988). Reflections on Notecards: Seven Issues for the Next Generation of Hypertext Systems. *Communications of the ACM*, 31(7):836-852, July 1988.

Heron, J. 1988. Validity in co-operative inquiry. In *Human inquiry in action*, ed P. Reason, Sage, Beverley Hills, pp. 40-59. Cited in Holian (1999).

Holian, R. (1999). Doing action research in my own organisation: ethical dilemmas, hopes and triumphs. *Action Research International*, Paper 3. Available online at http://www.scu.edu.au/schools/gcm/ar/ari/p-rholian99.html

Isaacs, W. (1999). *Dialogue and the Art of Thinking Together*. New York, NY: Random House.

Iser, W. (1978). *The act of reading*. Baltimore, MD: Johns Hopkins University Press.

Jacobs, S. & Aakhus, M. (2002). How to resolve a conflict: Two models of dispute resolution. In F. H. van Eemeren (Ed.), *Advances in Pragma-Dialectics* (pp. 29-44). Amsterdam: SICSAT.

Keller, C. & Keller, J. (1993). Thinking and Acting With Iron. In S. Chaiklin & J. Lave, Eds. *Understanding Practice: Perspectives on Activity and Context*. Cambridge University Press, Cambridge.

Kling, R. (1999).What is Social Informatics and Why Does it Matter? *D-Lib Magazine* (January 1999) Available online at http://www.dlib.org:80/dlib/january99/kling/01kling.html

Koskimaa, R. (2000). *Digital Literature: From Text to Hypertext and Beyond (Michael Joyce, Shelley Jackson, Stuart Moulthrop)*. Unpublished PhD thesis, University of Jyväskylä, Finland. Available online at http://www.cc.jyu.fi/~koskimaa/thesis/

Kunz, W., and Rittel, H. (1970). Issues as elements of information systems. Working Paper 131, Institute of Urban and Regional Development, University of California at Berkeley.

Landow, G. (1991) The Rhetoric of Hypermedia: Some Rules for Authors. In Delany, P. & Landow, G., Eds., *Hypermedia and Literary Studies*, pp. 81-103. MIT Press, Cambridge.

Lee, J., Lai, K. (1996). What's In Design Rationale. In T. Moran and J. Carroll, eds., *Design Rationale: Concepts, Techniques, and Use*. Mahwah: Lawrence Erlbaum.

Levina, N. (2001)."Multi-party Information Systems Development: The Challenge of Cross-Boundary Collaboration. Unpublished PhD dissertation, Massachusetts Institute of Technology.

Lovelace, A. (2001). Story in Art and Mediation. *In Motion Magazine* October 7, 2001. Available online at http://www.inmotionmagazine.com/al/alths1.html

Marshall, C. (2001). NoteCards in the Age of the Web: Practice Meets Perfect. *ACM Journal of Computer Documentation,* Vol. 25, No. 3. August 2001.

Marshall, T., Newton, S. (2000). Scholarly Design as a Paradigm for Practice-Based Research, *Working Papers in Art and Design*, Volume 1, ISSN 1466-4917. Peer-reviewed papers from the Research into Practice conference 2000.. Available on line at http://www.herts.ac.uk/artdes1/research/papers/wpades/vol1/marshall2.html

Mcleod, K. (2000). The Function of the Written Text in Practice Based PhD Submission. *Working Papers in Art and Design*, Volume 1, ISSN 1466-4917. Peer-reviewed papers from the Research into Practice conference 2000. Available online at http://www.herts.ac.uk/artdes1/research/papers/wpades/vol1/macleod2.html

Miles, A. (2003). Intent is Important: (A Sketch for a Progressive Criticism). *Journal of Digital Information*, Volume 3 Issue 3. Article No. 208, 2003.

Murray, K. (1995). Narrative Partitioning: The ins and outs of identity construction. Available online at http://home.mira.net/~kmurray/psych/in&out.html and ' (ed J. Smith, R. Harré, & Luk van Langenhove) Rethinking Psychology: Volume 1 - Conceptual Foundations Sage, 1995

Nachmanovitch, S. (1990). *Free Play: Improvisation in Life and Art*. Jeremy P. Tarcher/Putnam: New York.

Niederman, F.,Beise, C., Beranek, P. (1996). Issues and Concerns About Computer-Supported Meetings: The Facilitator's Perspective. *MIS Quarterly*, March 1996.

Nissley, N. (1999). Aesthetic epistemology: A proposed framework for research in human resource development. In the *Proceedings of the George Washington University, Center for the Study of Learning: Conference on Human and Organizational Studies* (pp. 306-356). Washington, D.C.: George Washington University, Center for the Study of Learning.

Nnadi, N. & Bieber, M. (2004). Towards Lightweight Digital Library Integration. In *Proceedings of the 2004 ACM Symposium on Document Engineering*, Milwaukee, 51-53, October 2004. Available online at http://web.njit.edu/~bieber/pub/nnadi-doceng04.pdf

Noll, J. & Scacchi, W. (1999). Supporting Software Development in Virtual Enterprises. *Journal of Digital Information*, 1(4), February 1999.

Novak, J.D., (1998). *Learning, Creating , and Using Knowledge: Concept maps as facilitative tools for schools and corporations*. Mahwah, N.J.,Lawrence Erlbaum & Assoc.

Oinas-Kukkonen, H. (1996). Hypermedia functionality in modelling tools, in *Proceedings of the Second International Workshop on Incorporating Hypertext Functionality Into Software Systems*, March 1996.

Okamura, K., Orlikowski, W., Fujimoto, M., Yates, J. (1994). Helping CSCW Applications Succeed: The Role of Mediators in the Context of Use. In *Proceedings of the 1994 ACM Conference on Computer Supported Cooperative Work*. Chapel Hill, North Carolina, United States.

Olson, G., Olson, J., Storrosten, M., Carter, M., Herbsleb, J., Rueter, H. (1996). The Structure of Activity During Meetings, in T. Moran and J. Carroll, eds., *Design Rationale: Concepts, Techniques, and Use*. Mahwah: Lawrence Erlbaum.

Orr, D. E. (2003). *Aesthetic practice: The power of artistic expression to transform organizations*. Unpublished PhD dissertation, Benedictine University

Osthoff, S. (1997). Lygia Clark and Hélio Oiticica: A Legacy of Interactivity and Participation for a Telematic Future. *Leonardo On-Line*, MIT Press. Leonardo Volume 30, No. 4 (1997). Available online at http://mitpress2.mit.edu/e-journals/Leonardo/isast/spec.projects/osthoff/osthoff.html

Palus, C., Drath, W. (2001). Putting Something In The Middle: An Approach To Dialogue. *Reflections*, 3(2).

Palus, C., Horth, D. (2002). The Leader's Edge: Six Creative Competencies for Navigating Complex Challenges. Jossey-Bass, San Francisco, 2002.

Palus, C., Horth, D. (2005). Aesthetic competencies of creative leadership: making shared sense and meaning of complex challenges. Submitted for publication, *Journal of Creative Behavior*.

Palus, C.J., Horth, D.M., Pully, M.L., and Selvin, A. M. (2003). Exploration for development: Developing leadership by making shared sense of complex challenges. *Consulting Psychology Journal*, 55 (1), 26-40.

Peirce, C. S. (1960). *Collected papers, Volumes one through six*. C. Harshorne & P. Weiss (Eds.). Cambridge: The Belknap Press of Harvard University

Press.

Petre, M. (2003) Disciplines of innovation in engineering design. In N. Cross and E. Edmonds (eds) *Expertise in Design: Design Thinking Research Symposium 6*. University of Technology, Sydney, Australia. ISBN 0-9751533-0-7. Available online at http://research.it.uts.edu.au/creative/design/papers/16PertreDTRS6.pdf.

Piccini, A. et al, Practice as Research in Performance (website of conference proceedings). Available online at http://www.bris.ac.uk/parip/

Reason, P. & Rowan, J. 1981, *Human inquiry*. Wiley, Chichester. Cited in Holian (2001).

Reeves, B. and Shipman, F. (1992). Supporting Communication Between Designers with Artifact-Centered Evolving Information Spaces: In *CSCW'92: Computer-Supported Cooperative Work*. ACM Press: New York.]

Rogers, Y. (2004). New Theoretical Approaches for HCI. *ARIST: Annual Review of Information Science and Technology*, no. 38. Available online at http://www.asis.org/Publications/ARIST/vol38.html

Rosenwald, G. & Ochberg, R., Eds. (1992). *Storied Lives: The Cultural Politics of Self-Understanding*. New Haven: Yale University Press.

Salverson, J. (2001). *Performing testimony: Ethics, pedagogy, and a theatre beyond injury*. Unpublished PhD dissertation, University of Toronto.

Sankaran, S. (2001). Methodology for an organisational action research thesis. *Action Research International*, Paper 3. Available online at http://www.scu.edu.au/schools/gcm/ar/ari/p-ssankaran01.html

Sawyer, K. (1996) The Semiotics of Improvisation: The Pragmatics of Musical and Verbal Performance. *Semiotica, 108*(3/4).

Sawyer, K. (1997). Improvisational Theater: An Ethnotheory of Conversational Practice. In *Creativity in Performance*, pp. 171-193, 1997.

Sawyer, K. (1998). The Interdisciplinary Study of Creativity in Performance. *Creativity Research Journal*, 2, 1, 11-19.

Sawyer, K. (1999) Improvised Conversations: Music, Collaboration and Development. *Psychology of Music*, 27, 2, 192-205.

Sawyer, K. (2001). The improvisational performance of everyday life. Journal of Mundane Behavior 2(2).   Available on-line at http://www.mundanebehavior.org/.

Sawyer, K. (2004). Creative Teaching: Collaborative Discourse as Disciplined Improvisation. *Educational Researcher*, Vol. 33, No. 2, pp. 12–20.

Scacchi, W. Hypertext for Software Engineering. in, J Marciniak, Ed., *Encyclopedia of Software Engineering, 2nd. Edition*, John Wiley and Sons, Inc., New York, 2002.

Schmidt, K. & Bannon, L. (1992). Taking CSCW Seriously: Supporting Articulation Work. *Computer Supported Cooperative Work (CSCW): An International Journal*, vol. 1, no. 1, pp. 7-40.

Schön, D. (1983).*The Reflective Practitioner*. Basic Books, New York.

Schrage, M. (2000). *Serious Play: How the World's Best Companies Simulate to Innovate*. Harvard Business School Press: Boston.

Schuler, D., Namioka, A. (1993). *Participatory Design: Principles And Practices*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Scrivener, S. (2000). Reflection in and on Action and Practice in Creative-Production Doctoral Projects in Art and Design. Working Papers in Art and Design, Volume 1, ISSN 1466-4917. Peer-reviewed papers from the Research into Practice conference 2000.. Available on line at http://www.herts.ac.uk/artdes1/research/papers/wpades/vol1/scrivener2.html

Seddon, F. (2005). Modes of communication during jazz improvisation. *B. J. Music Ed. 2005 22:1, 47-61.*

Selvin, A., Palus, C. (2003). Sensemaking techniques in support of leadership development. *Knowledge Management*, 7(1). http://www.kmmagazine.com

Selvin, A. (1999). Supporting Collaborative Analysis and Design with Hypertext Functionality. *Journal of Digital Information*, Volume 1 Issue 4, Article No. 16, 1999-01-14.

Selvin, A. Fostering Collective Intelligence: Helping Groups Use Visualized Argumentation (2003). In Kirschner, P., Buckingham Shum, S., & Carr, C. *Visualizing Argumentation: Software Tools for Collaborative and Educational Sense-making*. Springer-Verlag, London.

Selvin, A. & Buckingham Shum, S. (2002) Rapid Knowledge Construction: A Case Study in Corporate Contingency Planning Using Collaborative Hypermedia. In *Knowledge and Process Management*, Volume 9, Issue 2.

Selvin, A., Buckingham Shum, S. (2005). Making Knowledge Art: Learning from the Improvisatory Dynamics of Live Participatory Hypermedia Construction. Workshop

presented at *PARIP 2005 International Conference*, 29 June - 03 July 2005, Bretton Hall, West Yorkshire UK. Available online at http://www.bris.ac.uk/parip/ab_selvinshum.htm

Simonsen, J., Kensing, F. (1997). Using ethnography in contextual design. *Communications of the ACM*, (July) 40(7):82-88. Cited in Kling (1999).

Strauss, A. & Corbin, J. (1990). *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. Sage, Newbury Park, 1990.

Sullivan, G. (2004). *Art Practice as Research: Inquiry in the Visual Arts*. Thousand Oaks CA: Sage.

Swanson, B. L., Watkins, K.E. and Marsick, V. J. (1997). Qualitative research methods. In Swanson, R.A. and Holton, E. F. (eds.): *Human resource development research handbook: linking research and practice*. San Francisco: Berrett-Koehler, 88-113. Cited in Sankaran (2001).

Tate, A., Dalton, J., Buckingham Shum, S., Mancini, C., Selvin, A. (2004). CDRL A002AA – Integrated Battle Command Decision Support Systems: Experiment B Report for Co-OPR Application. Available online at http://www.aiai.ed.ac.uk/project/co-opr/expt/coopr-exptb-report.doc. Other materials available at http://www.aiai.ed.ac.uk/project/co-opr/expt/

Tripp, D. (1993). *Critical Incidents in Teaching: Developing Professional Judgment*. London: Routledge.

Voithofer, R. (2000). *Creating a New Media Pedagogy Through Cultural Studies Approaches To the Design of Educational Technology: Using Discourse, Subjectivity, and Agency to (Re)Tell Stories About Cancer*. Unpublished dissertation: University of Wisconsin. Available online at http://www.coe.ohio-state.edu/rvoithofer/html/Dissertation.pdf

Weick, K., Meader, D. (1993). Sensemaking and Group Support Systems, in L. Jessup and J. Valacich, eds., *Group Support Systems: New Perspectives*. New York: Macmillan.

Weick, K. E. (1995). *Sensemaking in Organizations*. Sage, Thousand Oaks.

Wilber, K. (2000). *Eye to Eye: The Quest for the New Paradigm, 3rd Edition*. Boulder: Shambhala Press.

Yakemovich, K. C., Conklin, J. (1990). Report on a Development Project Use of an Issue-Based Information System, in *CSCW '90 Proceedings*.

Yoong, P. K., Gallupe, R. B. (2002). Coherence in face-to-face electronic meetings: A hidden factor in facilitation success. *Group Facilitation: A*

Research and Applications Journal. Issue #4 Summer 2002. Available online at
http://www.iaf-world.org/i4a/pages/index.cfm?pageid=3502

Yoong, Pak and Pauleen, David. (2004). Generating and analysing data for applied
research on emerging technologies: a grounded action learning approach. Information
Research, 9(4) paper 195. Available online at http://InformationR.net/ir/9-
4/paper195.html