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Making Meetings into Knowledge Events

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Compendium: Making Meetings into Knowledge Events

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Executive Summary

In this paper, we describe the *Compendium* methodology and suite of tools. Compendium is the result of over a decade's research and development at the intersection of collaborative modeling, organizational memory, computer-supported argumentation and meeting facilitation.

We claim that Compendium offers innovative strategies for tackling several of the key challenges in managing knowledge:

- **improving communication** between disparate communities tackling **ill-structured problems**

- **real time capture** and integration of **hybrid material** (both predictable/formal, and unexpected/informal) into a **reusable group memory**

- transforming the resulting resource into the **right representational formats** for different stakeholders.

Our starting point is the face-to-face meeting, potentially the most pervasive knowledge-based activity in working life, but also one of the hardest to do well. *Meetings* in Compendium's perspective:

1. **are untapped knowledge-intensive events:** often they are unfocused, but they can be improved with facilitated tools that help participants express and visualize views in a shared, common display;

2. **can be more tightly woven into the fabric of work:** they are preceded and followed by much other communication and the generation of associated artifacts.

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Weaving the process and products of meetings into this broader web of activity must therefore be a priority.

Firstly, we introduce the core elements of Compendium's approach to mediating face-to-face meetings (now used in a variety of large scale projects). We have found that a combination of facilitation with visual hypertext tools can improve potentially unproductive or explosive meetings between multiple stakeholders with competing priorities. Diverse perspectives can be captured, structured and integrated in a way that all participants collectively own as a trace of their discussions. In the process this constructs a structured, group memory which shows where the same concepts have been discussed in different contexts, why decisions were made, and allows one to harvest related concepts from multiple meetings.

Secondly, we describe how these 'conversational maps' can be integrated with pre/post-meeting activities and documents. Compendium's maps are designed to support the granular representation of concepts (as hypertext database objects) so that they can be spatially organized, recombined and reused in multiple contexts. We are developing ways to convert material in conventional applications such as written documents, emails and spreadsheets into concept maps, so that their contents can be analysed in new ways, and integrated with other maps.

Conversely, we have placed great emphasis on generating alternate documents directly from maps, since one of the most common purposes of meetings is to advance a project deliverable of some sort, typically, an organizational document of an established genre, using established notations and stylistic conventions. We automatically transform visual maps to file formats for other applications, so that other user communities can immediately benefit from the meeting's collective work. This is illustrated in a number of ways:

- **Transforming maps** into formal notations (eg. data flow diagrams), and requirements documents following established formats

- Using maps as a collaborative **knowledge-elicitation interface**, generating input for knowledge-based applications and simulations

- From **synchronous to asynchronous interaction**: transforming maps created in real time into web-based interactive discussion-documents to solicit wider, asynchronous input

- **Ontology-based formalization**: in domains where it is possible to work with formal knowledge models, discussion-documents can be annotated with links to ontologies

- Engaging with **visual, emotional knowledge**: using maps to capture collaborative sense-making using images to express intuitions and metaphors

To conclude, Compendium excels in enabling groups to collectively elicit, organize and validate information required by a particular community for a particular purpose. In order to integrate this with pre/post-meeting processes and artifacts, these maps can be generated by, and transformed into, other document formats, enabling asynchronous discussions around the contents of maps, and other forms of computation and analysis. In our experiences to date, the domain independence of Compendium's mapping technique for meetings, combined with its interoperability with domain-specific applications, provides a powerful platform for knowledge construction and negotiation.

1.   Introduction

There are many challenges to the successful introduction and deployment of knowledge technologies, both within established organizations and more diffuse networks. Some of these are technical, but in our view, the human (cognitive/social/organizational) dimensions are at least as, if not more, complex. Document types can be defined; databases integrated; metadata and ontologies agreed upon; collaboration tools installed. But without integrating these into the organizational working life of the individuals concerned, these tools remain detached, and eventually dropped, from real life.

In this paper we describe several years' work in a number of projects which are now converging conceptually and technically, directed towards the problem of designing useful knowledge technologies. We describe an approach that seeks to work with the most pervasive 'knowledge event' in working life — the meeting — but as many will recognize from bitter experience, also one of the hardest to do well. Moreover, meetings do not take place in a vacuum: there is a history of previous meetings, a constellation of concepts and artifacts that is brought into the meeting, which often evolves as a result of the meeting, and are taken into work activities afterwards. We describe how synchronous, face-to-face interaction can be integrated technically and socially with asynchronous, distributed interaction, often around documents that need to be critiqued, and annotated both informally (comments and threaded discussions) and formally (using organizational knowledge models, or ontologies).

2.   Compendium

Compendium, first developed in 1993 as an approach to aid cross-functional business process redesign (BPR) teams, has been applied in several dozen projects in both industry and academic settings [7,8,10]. Its origins lie in the problem of creating shared understanding between the team members, typical of those attending teams working over weeks or months to design business processes: keeping track of the plethora of ideas, issues, and conceptual interrelationships without needing to sift through piles of easel sheets, surfacing and tracking design rationale, and staying on track and "bought-in" to the project's overall structure and goals [15].

The set of techniques which represent the *Compendium* approach revolve around a graphical hypermedia system for the development and application of (i) question-oriented *templates,* which serve as semiformal ontologies to structure the subject matter of a particular project (Figure 1), and (ii) a set of *metadata codes* that can be assigned to any concept in the database (Figure 2). A hallmark of the approach is the ability to move between formal and prescribed representations and informal, ad hoc communication, incorporating both in the same view if that is helpful to the participants. Hypertext nodes and links can be added either in accordance with templates or in an opportunistic fashion.

The key feature of the early approach was the combination of an Issue-Based Information System (IBIS) concept-mapping tool [2], which supported informal and exploratory conversation and facilitation, with a structured modeling approach [9]. This allowed teams to move along the spectrums of *formal to informal representation*, and *prescribed to spontaneous approaches*, as their needs dictated. It also let them incrementally formalize data [13] over the life of the project. As the approach was tested and refined over the course of several years, additional modelling methods were added, plus tools to transform Compendium's hypertext models into established organizational document forms, and vice-versa [11].
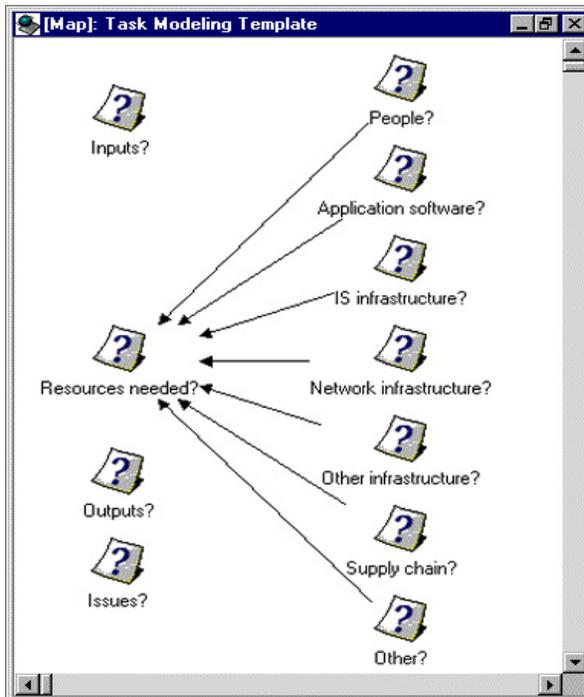
Figure 1: A Compendium question template representing the concerns of a particular stakeholder group (application in Figure 3).
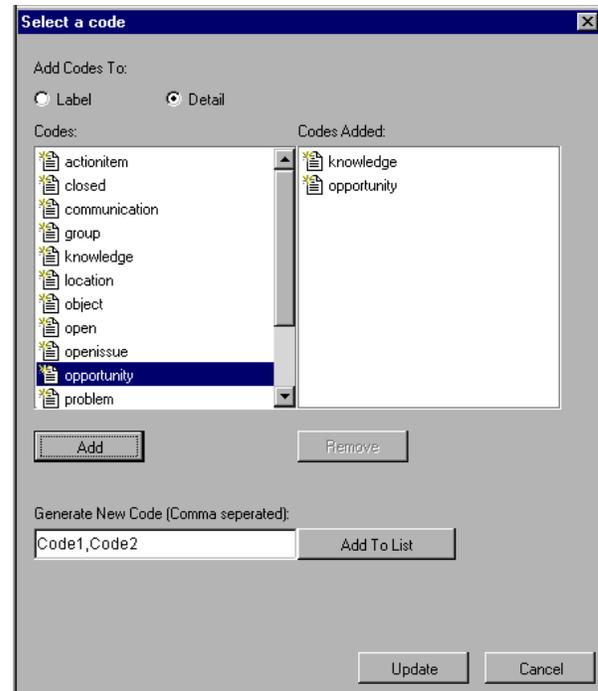

Figure 2: Optional metadata codes added to the content of a node assist subsequent harvesting and analysis of elements.

Elsewhere, we have reported a number of Compendium case studies in which the tool coupled with expert use played a key role in bringing together diverse stakeholders, capturing and integrating their perspectives in a coherent group memory system [10-12].

In our experience, Compendium introduces a distinctive element to the design space of knowledge technologies, namely, making meetings into true events for group knowledge creation which leave a *trace*—a structured, collectively owned, searchable group memory that is generated in real time as a product of a meeting. Effective, on-the-fly construction of knowledge resources does not come 'for free'—the lower the effort invested at the capture stage (e.g. simply video recording all meetings, or taking conventional minutes), the more work is required for collective reuse and computational support. Naturally, we want quality knowledge resources for minimal effort, and while smart analysis technologies will continue to push the boundaries, there are pragmatic factors to consider: what is possible *now*? Compendium tackles the capture bottleneck that any knowledge construction effort must confront, by investing effort in real time quality capture by a facilitator, mediated and validated by those at the meeting. Individuals exposed to Compendium have gone on to learn to use it themselves, or have been formally trained.

However, like any representation, the kinds of 'conversational' maps that we have introduced are good for certain tasks, whilst others are better supported in other tools. Moreover, meetings do not take place in a vacuum, but rather, in a rich conceptual and historical 'web' of previous meetings, concepts, tools and documents. We focus now on how this meeting mediation and capture technique can be integrated with other knowledge tools and processes that feed into, and flow from, meetings.
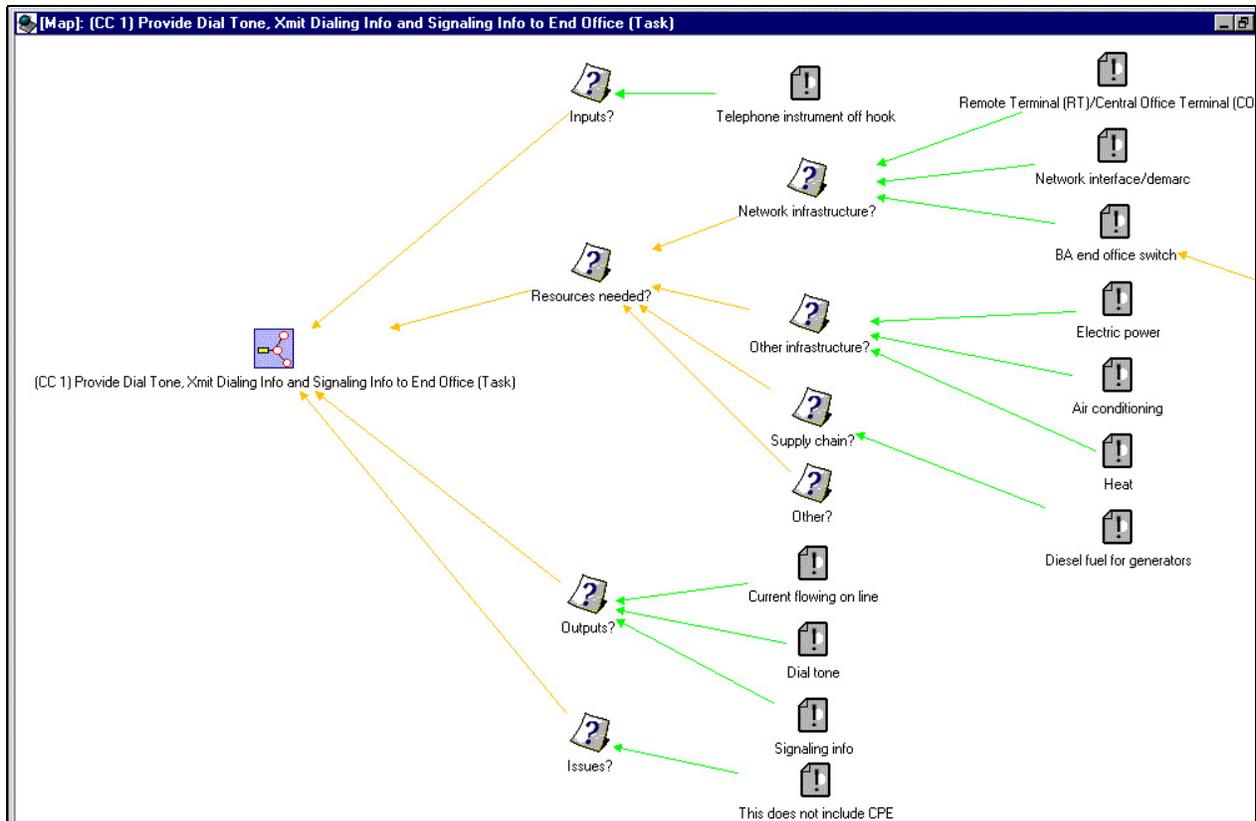
Figure 3: Instantiating the Compendium template from Figure 1 (from case study in [12]).

3.   Converting organizational documents into hypertextual maps

The structure of the hypertext concept maps — especially the *Questions* asked — is either decided by the participants faced with a blank screen at the start of a problem-solving session, and/or derived from an existing ontology or methodology. However, we have also developed ways to *generate* the maps from other applications, to support the collective, conceptual analysis (e.g. chunking, clustering, linking, systematic reuse) that granular, hypertextual objects facilitate. An example is shown in Figure 4, in which we can morph a document or email message into a corresponding visual map by transforming headings and first lines of paragraphs into node names, and placing the rest of the text in the detailed content of nodes. This provides a rapid way to import a significant document into the visual mapping environment for further discussions, analysis and integration with existing maps.
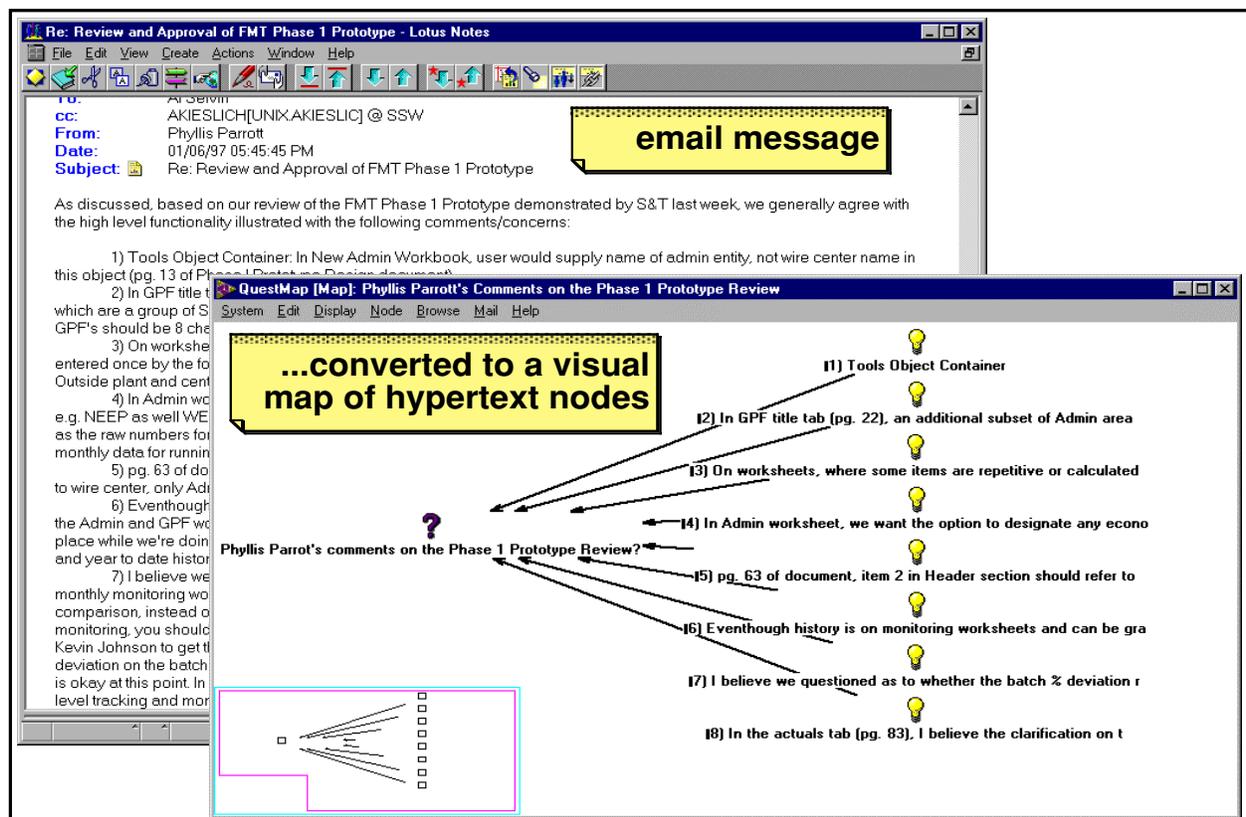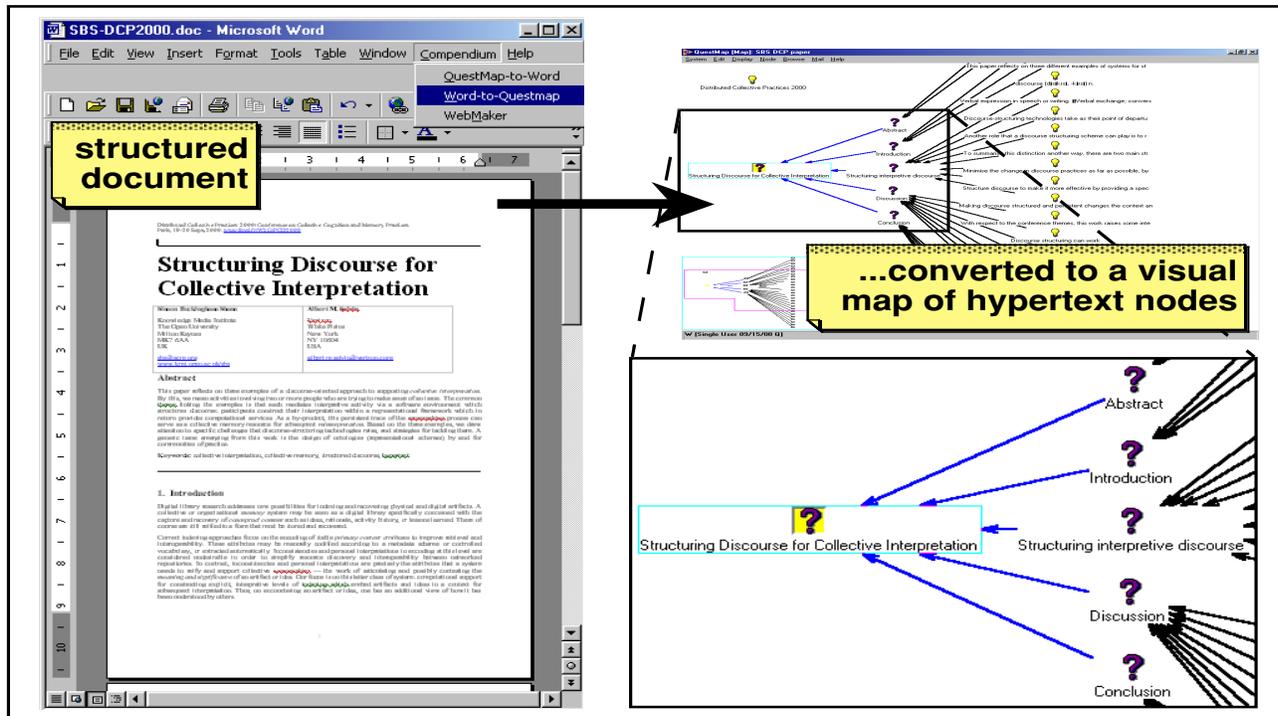
Figure 4: Generating a hypertext map (top) from the contents of a structured document, and (bottom) from an email message. This transforms the source document into granular elements (hypertext nodes) that can be viewed in a spatial manner in relation to other elements, linked into other structures, and reused in multiple contexts.

4. From maps to other organizational documents

One of the most common purposes of meetings is to advance a project deliverable of some sort, typically, an organizational document of an established genre, using established notations and stylistic conventions. Compendium excels in enabling groups to collectively elicit, organise and validate information that is needed by a particular community for a particular purpose — who typically will have their own working and document styles. To invoke the knowledge management mantra, in order to 'deliver the right information in the right form to the right people at the right time', we need automatic morphing from visual maps to myriad file formats and notations for direct importing into other applications. If hand-coding of maps is required, Compendium's visual mapping will either fall by the wayside or fail to be adopted except by a few enthusiasts. In Figure 5, we illustrate how a map can be used as a collective user interface to elicit the information required to generate a completed data flow diagram and requirements specification document for other communities.
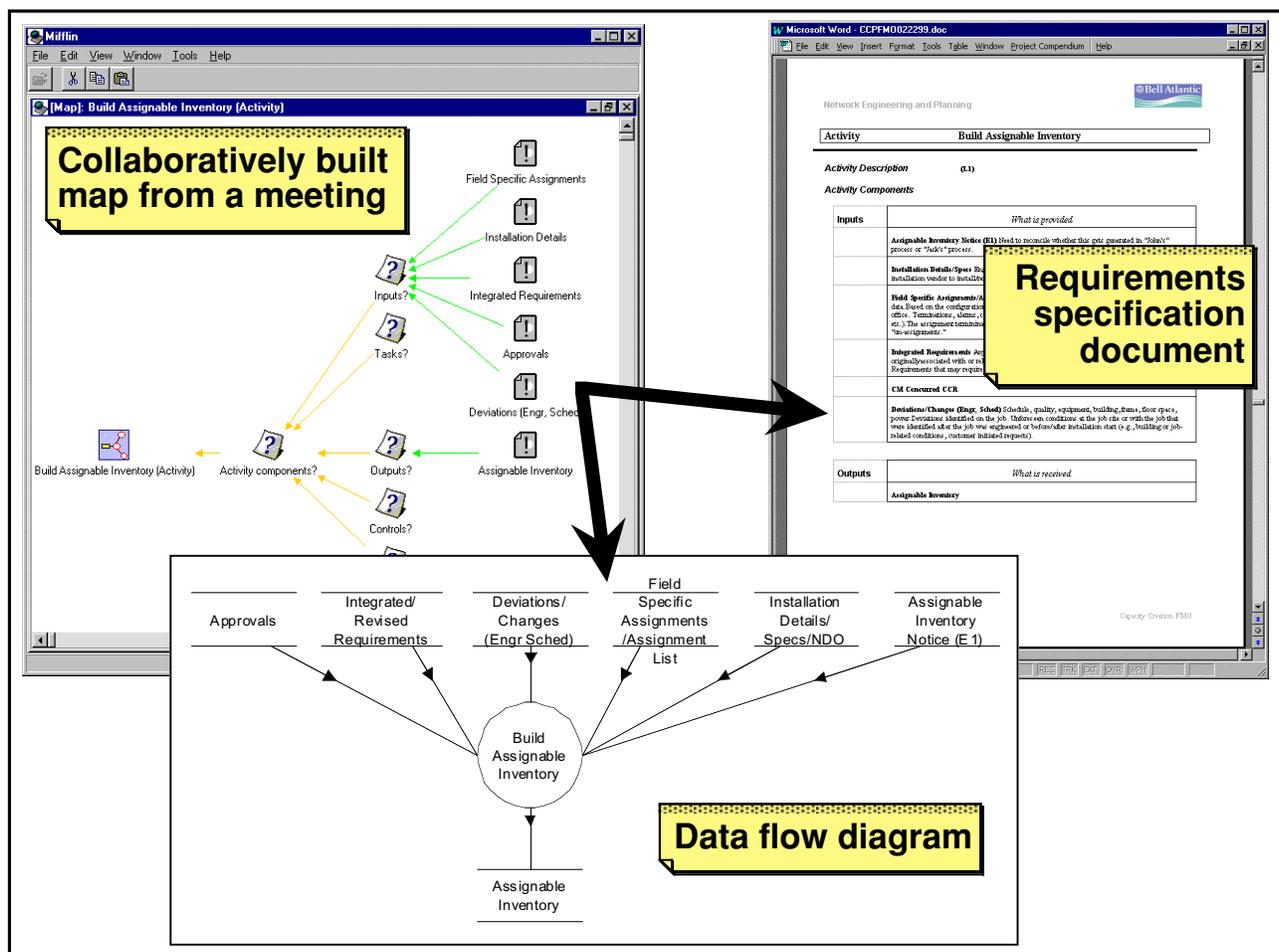

Figure 5: Generating organizational documents from a Compendium hypertext map [11]

5. Knowledge-elicitation for knowledge-based applications

The example above shows how Compendium has been used firstly, to provide an intuitive, visual mapping interface to bring together multiple stakeholders who need to agree on how to model a domain, and secondly, how to morph this map into appropriate document types for other groups to work from. Compendium can also be used to tackle the 'knowledge acquisition bottleneck' for knowledge-based applications.

One of the basic ideas for using Compendium for domain modeling for simulation is to develop the conceptual model first. Compendium is specifically good at allowing designers, knowledge engineers, and domain experts to collaborate on the development of a conceptual model of the system. Indeed, the benefit of a conceptual model in Compendium is the lack of syntactical and semantical complexity that come with other conceptual modeling languages (such as semantic networks). In other words, answering questions in a natural language is easier than having to understand what the arrows and boxes mean in most other languages. The visual notation hides the complexity of the modelling language from the user, releasing them to focus on answering the questions posed by the template. Maps are then converted into knowledge base entries for subsequent analysis in simulations (Figure 6) or a digital library server (Figure 7).
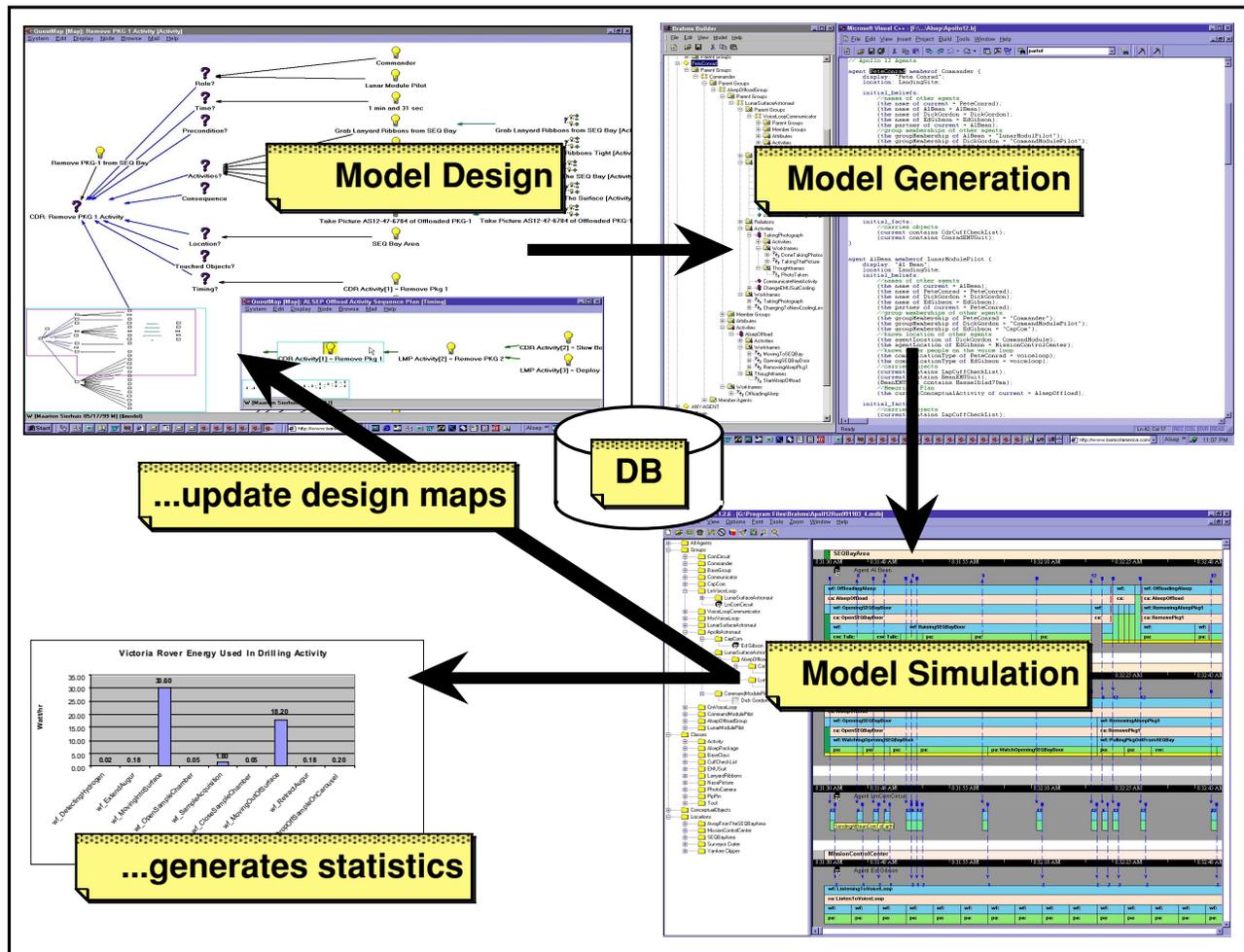

Figure 6: Deriving a Compendium hypertext template from a modelling approach, in order to elicit information to seed the associated simulation environment [14]
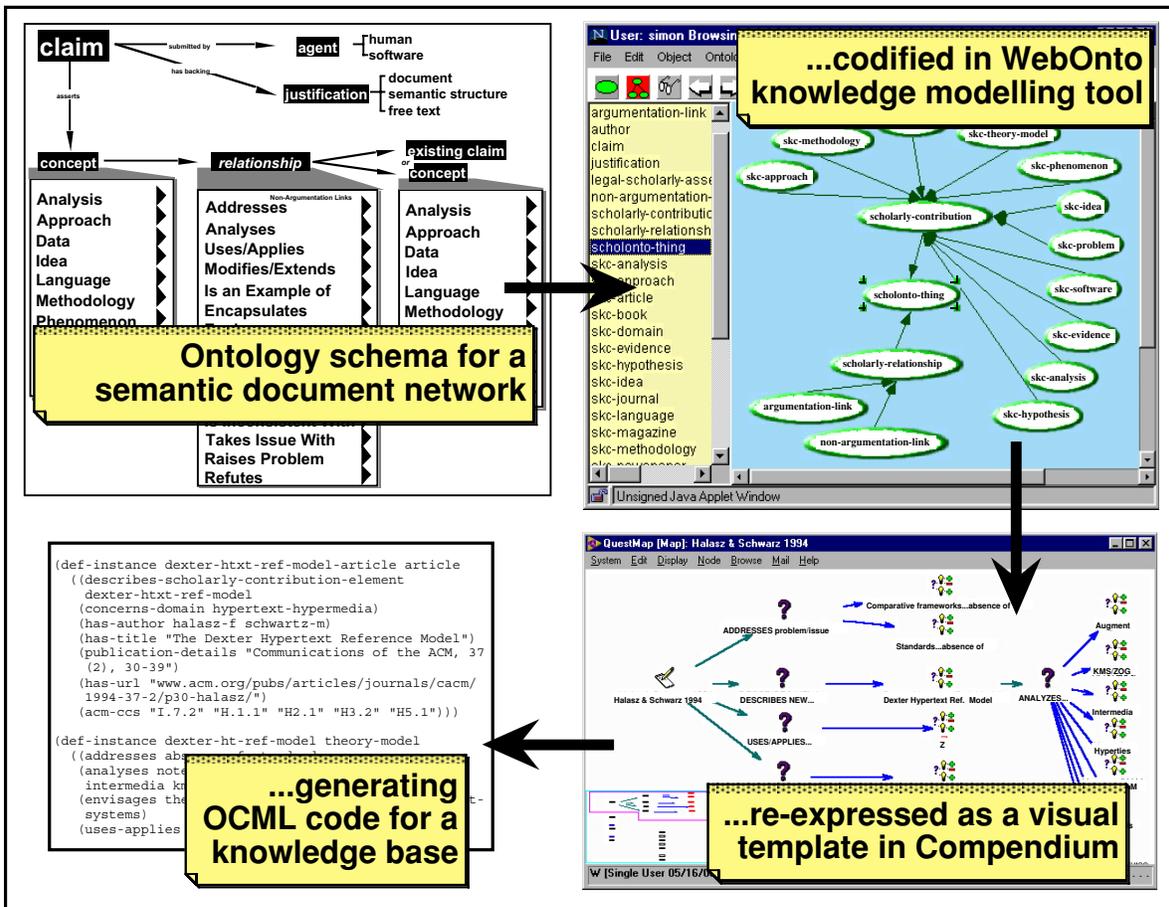
Figure 7: Deriving a Compendium hypertext template from an ontology, in order to elicit information to seed the associated digital library knowledge-base [1]

6. From synchronous to asynchronous interaction

Compendium mapping has primarily been used to mediate face-to-face interaction, although asynchronous mapping via LANs has been used on occasion. However, in keeping with the notion that the wider organization may prefer more conventional documents and user interfaces, we can generate a structured Web document discussion site from a map, as shown in Figure 8. By exporting a hierarchical map to a textual outline in HTML, subsequent processing by the D3E system [3,16] generates a Web user interface in which the document is tightly linked to discussion threads. Readers can click in the document to quickly see who has commented on a given issue, switching smoothly between reading and interaction. This makes it possible to circulate the results of a meeting captured in Compendium to a wider audience to solicit feedback on a familiar, hierarchical document structure via a threaded discussion interface. A future goal is to morph the resulting discussion space back into visual map form, in a similar manner to that illustrated earlier (morphing from word processor and email—Figure 4).
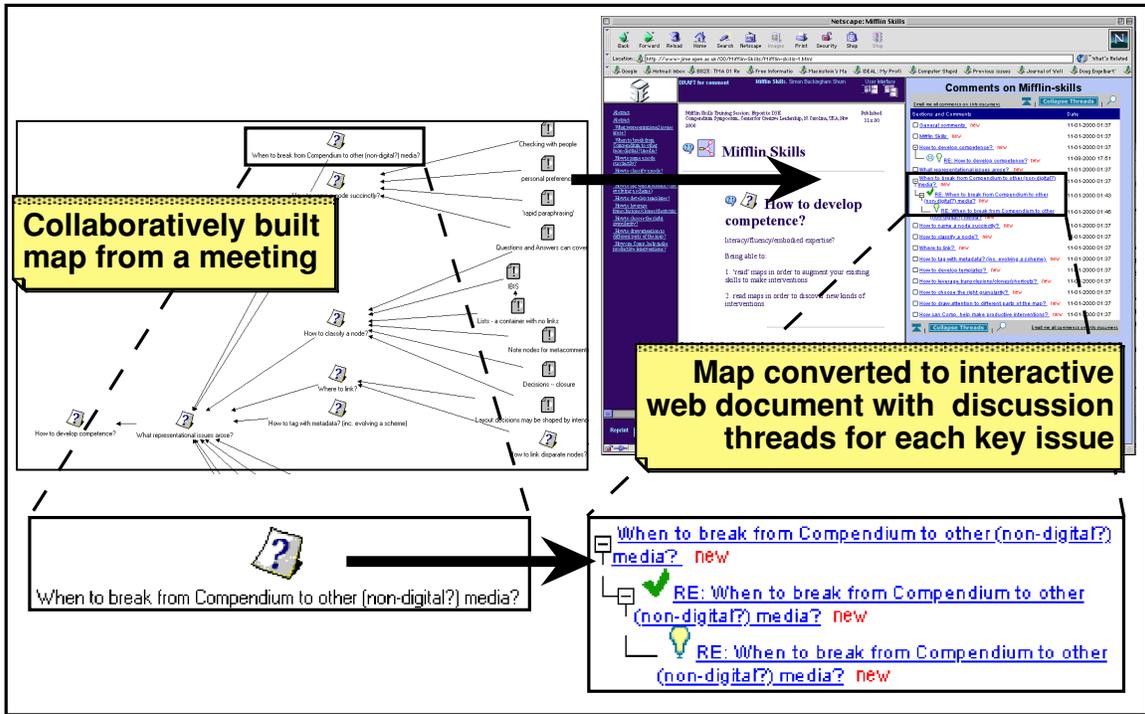
Figure 8: Publishing a Compendium map as a document for structured, threaded discussion on the Web, using D3E [3]
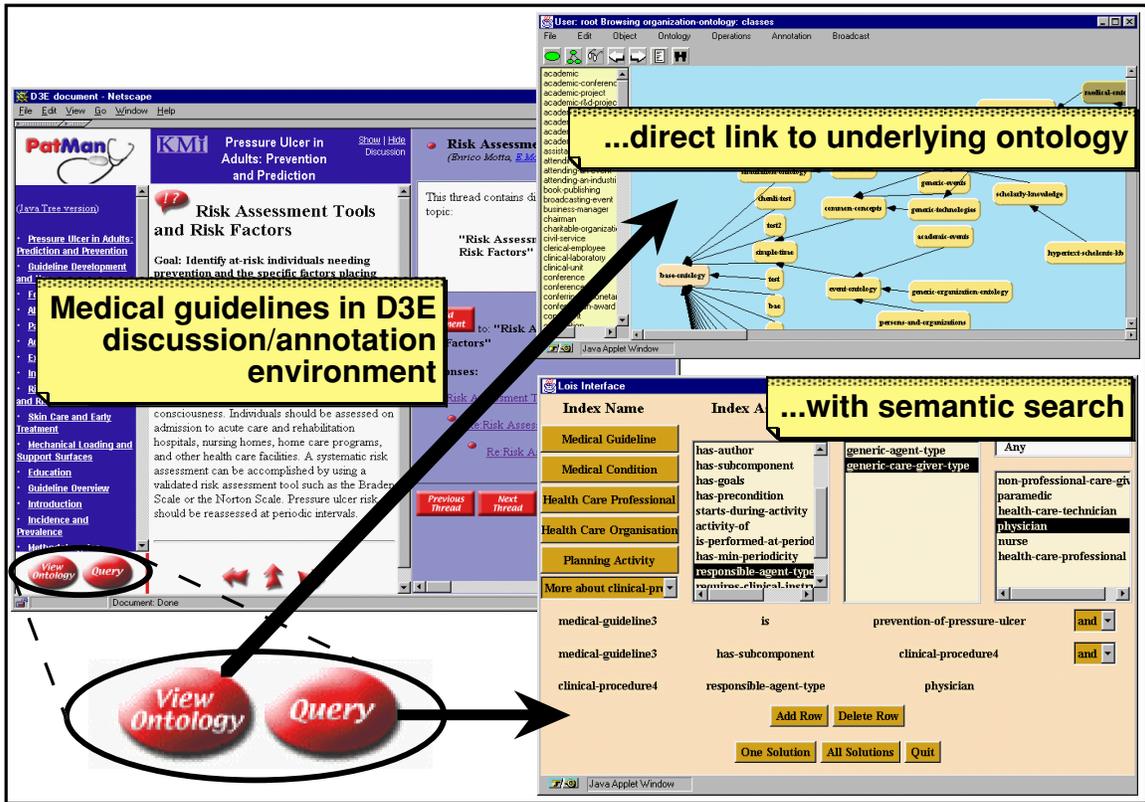
Figure 9: Integration of a Web discussion document with tools for knowledge modelling and semantic search [5]

7.   From informal annotation to ontological enrichment

It is useful to take the "document enrichment" a step further down the formalization route in certain domains. Having generated a document discussion environment from a map, this can be linked with ontology tools for knowledge modelling and semantic search. Figure 9 shows a web discussion document linked to an ontology (a structured model of concepts and relationships in the domain), which in turn generates a semantic search interface. Details are presented in [5].

Documents can also be enriched through direct annotation of the text, as illustrated in Figure 10. The tool shown is for knowledge management specialists who are comfortable working with ontologies, but we are now developing Web annotation tools for non-specialists.
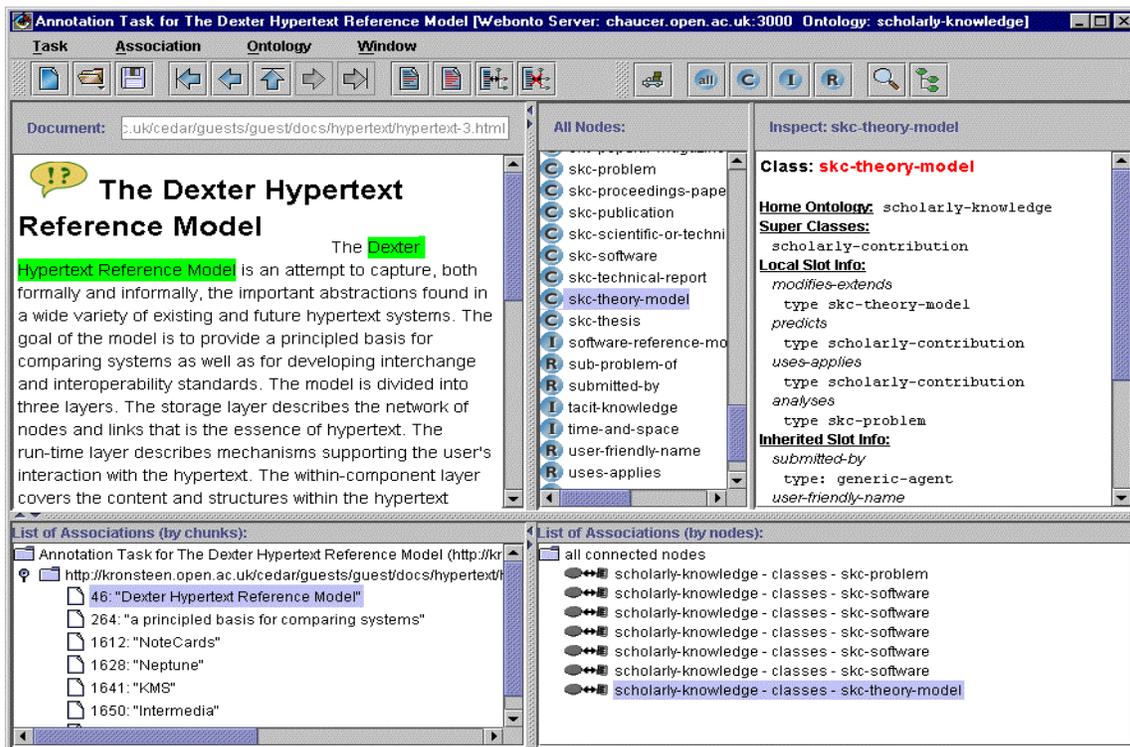

Figure 10: Annotating a document directly with ontological concepts (Enrich Project [4]).

8.   Engaging with visual, emotional knowledge

Most knowledge technologies are concerned with *textual symbolic* representations. However, this is to the neglect of other modalities of reasoning, pattern recognition and reflection. A strand of our work is developing techniques to assist senior managers in gaining insight into their own and their colleagues' understandings of ill-structured problems through the use of imagery and metaphor. Figure 11 illustrates how the *Visual Explorer* technique [6] has been integrated into the Compendium methodology to assist the capture and reuse of visually-grounded sensemaking.
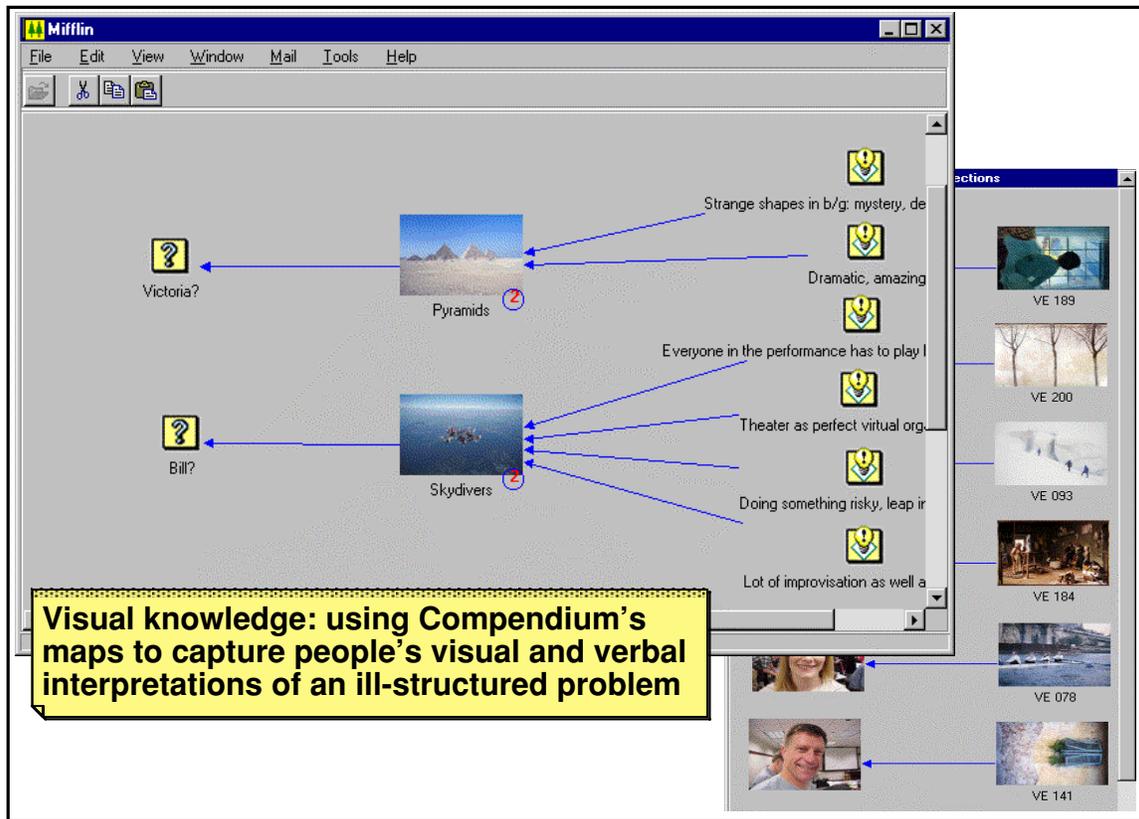
Figure 11: Using Compendium to mediate the *Visual Explorer* technique for image-based, collaborative problem analysis [6]

9. Summary and future work

To conclude, we are developing, deploying and extending an approach called *Compendium*, as socio-technical support for knowledge intensive tasks. We have outlined examples including business process analysis involving diverse stakeholder groups, collaborative modeling and knowledge elicitation, and semi-structured creative problem analysis, which combine images, text and structural maps. Compendium provides representational support for mediating and capturing meetings, and interfaces to other tools used to do work between meetings.

Compendium occupies a particular region in the design space of knowledge management technologies, focusing on augmenting team interaction. The centrality of hypertextual in-situ mapping places particular emphasis on being able to capture not only structured, well understood material, but also the unexpected and informal material that may otherwise never be caught by more rigid notations or tools.

The Compendium user community is a loose confederation of practitioners in many fields, and researchers from many disciplines. Future work is likely to include further extensions to the core Compendium hypermedia tool, interfaces to other applications, and the consolidation and sharing of practitioner expertise with it in different contexts.

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