

IBM Research Report

Shared Landmarks in Complex Coordination Environments

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ABSTRACT

We explore the concept of social landmarks in complex, shared information and coordination environments. Previous research in navigation and shared spaces has tended to emphasize individual navigation, formally inscribed spaces, social filtering, and boundary objects. Based on ethnographic research into complex collaborative work in organizations, we extend the concept of navigational "landmarks" to include not only individually-used documents, but also shared landmarks in the form of persons, roles, and events. This emerging concept of social landmarks may be applied in identifying and representing these coordinating points, to support the work of teams and organizations in complex projects.

Categories and Subject Descriptors

H.5.3 [Group and Organizational Interfaces]: *collaborative computing, computer-supported cooperative work, theory and models.*

General Terms: Office work; Collaboration; Coordination; Articulation.

Keywords: Landmarks; Boundary objects

INTRODUCTION

In this brief report, we describe an emerging concept in social navigation of common information spaces: *shared landmarks*. This concept is based in our study of how teams orient, navigate, and work together while working on complex activities in organizations (e.g., [8, 9]). Specifically, we have studied how people collaborate in the organizational practices around receiving a Request For Proposals (RFP) and in Proposal Writing (PW) in response to that request. In a more survey-oriented manner, we have begun to study other complex team activities.

The problem of coordinating and collaborating in organizational settings has been studied extensively (e.g., [12]), and for a long time (e.g., [6, 14, 18]). In this brief report, we will not attempt a literature review. Rather, we will focus on three lines of thought, and we will try to bring them into convergence.

The first line of thought comes from studies of landmarks in HCI design. A number of researchers have made extensive studies of how individuals use recognizable features as means for finding paths through complex information spaces (e.g., [1, 3, 5]). We extend this relatively individualistic use of landmarks to a shared, collaborative setting.

The second line of thought is Schmidt's treatment of formal constructs in cooperative work [13, 15], and its dialogue with Suchman's concept of situated action [17]. Schmidt considered two conceptions of coordinated work: formal and informal. He surveyed in depth a number of accounts of how artifacts in collaborative work may serve as formal coordination points. Suchman formulated a different account, in which formal structures serve as canonical accounts of action, while actual workers navigate in a more informal sense in a "map" of the work and the social relations around the work (see also [7]). Schmidt pursued the inscription of meaning onto formal artifacts as they were operated on, and as they were moved through an abstract organizational workspace (where the concept of a "map" may still have relevance). We are concerned here with the artifacts as they may appear as "landmarks" on the "map" of collaborative work. Crucially, however, we want to generalize from formal artifacts to other, less formal entities that may be equally visible on the "map" of collaborative work, and that may serve similar functions for coordination and articulation.

The third line of thought is Star's and Bowker's concept of boundary objects, and the combination of boundary objects into infrastructures (for review, see [2]). A boundary object may be

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Figure 1. CARD poster of Proposal Writing process, overlaid with activity descriptions.

thought of as a shared object that may have different meanings for different constituencies. A boundary object is thus a potential site of coordination of shared work, exactly because it may take on multiple meanings, and people may have to negotiate those meanings as they work with the boundary objects. Collections of boundary objects have been termed infrastructures [16], which provide not only the objects themselves, but also their interrelations. Infrastructures thus are composed of both a collection of discernable objects or entities *and* the social practices that make use of those objects or entities.

Method

During July and August 2004, we interviewed 15 people who were involved in the PW process in fifteen organizations, distributed across eight companies. In five cases (different company in each case), our informants worked with us using the CARD technique [10], through which they co-constructed a poster illustrating their own practices, and the practices of their organization, in responding to an RFP. We captured partial transcripts of the CARD sessions on audio tape. In the remaining ten cases, our informants described their work orally.

Because PW is of great commercial importance in consulting organizations, we were sometimes allowed to look briefly at actual RFPs and response Proposals, but we were not allowed to study them in detail (i.e., their contents were proprietary). Informants sometimes mentioned proprietary resources and databases (e.g., customer relationship management systems), but we were generally unable to examine these.

This report is based on preliminary coding of the CARD posters and partial transcripts. We continue to work with these data, and hope to complete a more thorough analysis.

Results and Interpretation

Figure 1 presents one of the CARD posters co-created by an informant and two of us. The high-level activities described by the informant in this poster are similar to those reported by other informants. The organization takes an affirmative interest

in soliciting business from a client. These activities occur *before* the conventional, formal start of the RFP and PW processes, with an initial analysis of whether this client's business is worthwhile to the company, and with early, informal work to establish a partner relationship. Through that relationship, the consulting company informally assists the client in creating an RFP. (Other companies reported a more reactive stance, in which they waited for an RFP to arrive.) Once the RFP is received, the consulting company forms a team, tracks the client contact through a Customer Relationship Management (CRM) system, and holds a "kickoff meeting" (in the US way of speaking) for their PW team. The team then creates content for the proposal, estimates the costs to the client through relatively formal tools (e.g., spreadsheets), iterates on the proposal, obtains approvals from relevant corporate officers, and delivers the proposal to the client.

Figure 1 was an account of the PW process in one of our informants' companies. Although this brief space does not allow us to present similar results for the four other companies' CARD sessions, we present summary observations of regularities that we observed, based on the five CARD sessions and the textual contents of other interviews. We found many of the same objects and entities in most or all of the accounts of PW work:

Documents

It is obvious that the PW work was oriented around two formal documents: The RFP and the Proposal to the client. In a few cases, there were interim documents exchanged between client and consultant, such as in indication of Intent to Submit a proposal. In addition to these relatively obvious and formal types of documents, other types of documents were present in nearly all of the accounts: Prior proposals (which could be searched for re-usable text and/or strategies), "boilerplate" text (standardized text that was prepared to be copied directly into a proposal – e.g., the consulting company's profile), forms (for internal accounting), budgets (for the PW activity, and for the eventual work that was proposed), project schedules, and several types of government certifications. Informants reported various amounts of intense work around these less obvious types of documents – some of which could be used straight-away, but others of which presented significant obstacles to progress. These types of artifacts appear to correspond to the formal artifacts, inscribed with specific content, that were studied by Schmidt and colleagues.

Dates and Calendars

A second, relatively obvious point of orientation and articulation is dates and schedules. Work commenced and ended at certain recognized moments, which could sometimes be negotiated. However, the addition of specific types of events to the calendar makes a more complex and nuanced set of shared references.

Events

At least in their US offices, most of the companies held a “kickoff” meeting at the beginning of the PW process. In some cases, substantive work was done in this introductory meeting. But in some cases, the meeting was described as a “meet and greet” occasion for people who had already been assigned to the team, and whose roles had already been established. A second type of meeting was the client presentation, which had both formal attributes of presenting and defending the proposal (sometimes referred to as “eight hour orals”), and also less formal attributes that were explicitly discussed, such as “present a good image to the client... dress better than the client... show that you are versed on the client.”

The ubiquity of these meetings (across PW accounts from multiple companies) suggests that they took on importance and significance to the organizations and their members. The number of instances allows us to look for commonalities among them. We note with interest that, while the *content* of the meetings varied considerably, their presence in the PW process was relatively constant. These meetings appear to have been a sort of “marker” of the initiation and conclusion of projects, or of project phases. While the contents of the meetings may have been variable (ranging from task assignment to “meet and greet”), their occurrence was routine. They thus became a form of shared landmark that helped workers to recognize project phases and to coordinate their actions with regard to those project phases.

Roles and Persons

Much of the work was articulated around people. In some cases, the *role* of the person appeared to matter more than her or his identity. For example, major events in small consulting companies depended upon the action of “a partner,” whose name was not specified, but whose rank in the company was crucial. Partners often gave approval for the PW to commence, and almost always had to approve *in writing* the proposal before it was delivered to the client; in some cases, partners also performed task or role assignment to staff on PW teams. In other cases, actions were described in terms of roles, rather than individuals – e.g., “SP [Sales Person], sales management, and DC [Director of Consulting services] discuss approach, make account and sales strategy” and “Sales will read through the document and then give it to one person, either an Engagement Manager... or an Analyst.” Thus, the role becomes a principal point for organizing the work, as well as for carrying it out.

In other cases, individual persons had high visibility in informants’ accounts: “Charlie (VP in charge of consultants) assigns Kevin as the Engagement Manager. Kevin is now going to have to read the RFP. Kevin starts planning what he is going to do... Kevin will write everything, all 300 pages” and “Kevin hosts a project kickoff meeting... It’s a meet and greet; the team’s roles were assigned ahead of time by Kevin and Charlie.” In yet other cases, the informant mixed names and roles, as “Sales, Charlie, and the client contact will read, review, and edit Kevin’s proposal document.” Significantly, all

three of these modes of description – pure roles, pure names, and mixed roles and names – came from the same informant. Other informants also provided descriptions based on roles and/or persons.

It appears that certain roles (partner, engagement manager) become points of articulation for the work. In other cases, certain personalities (Charlie, Kevin) appear to have leadership attributes or responsibilities that make them, points of articulation.

Systems and Databases

Certain databases and systems also took on important coordinating significance. In some accounts, a CRM (Customer Relationship Management) system was used to log significant events. In other accounts, a database of old proposals or of boilerplate text played an important role in assignments and in carrying out the work.

Discussion: Landmarks and Infrastructures

We have begun to think about these recurring aspects of informants’ accounts of shared work – documents, dates, events, roles, persons, and systems – as *shared landmarks* that can be used for social navigation (e.g., [11]) of the collective work. These landmarks function in several different contexts: the physical domain of documents, the online interplay of communications, and the social world of human-to-human communication. We found that it was straightforward to map the activity-oriented description of Figure 1 into these landmarks. For example, the generic and abstract concept of “qualify the opportunity” (Figure 1) maps in part into a specific landmark as a Customer Relationship Management system. Similarly, the nebulous activity “establish partner relationship” maps onto a more specific and identifiable landmark, “client presentations.” We propose a provisional set of attributes of shared landmarks:

- Landmarks are *shared* among multiple workers, and (significantly) across different types of work or communities of practice (e.g., managers, writers, subject matter experts)
- Landmarks are *negotiated* – not so much in terms of their landmark *status*, but in terms of their *contents*. For example, there will be a proposal, but the work in the proposal must be specified. Similarly, there will be a budget, but the size of the budget is often hotly contested between sales people (who want a low, winning bid) and development people (who want a realistic budget to cover the actual work to be done).
- Landmarks depend on one’s *perspective*. How people see each landmark may depend on their roles in the shared work. People may need to negotiate a common understanding of the meaning of each landmark.
- Landmarks have *relationships* between them. For example, different roles are related through an organization chart, or through a team structure. Similarly, milestones and deliverables may have dependency relationships. Certain roles may have “ownership” of certain documents, and so on.

- Landmarks are *heterogeneous*. The full set of landmarks in our study includes the diverse types of objects described in the “Results and Interpretation” section: documents, dates, events, roles, persons, and systems.
- Landmarks occur as *structured collections*, and are used as *articulation infrastructures*. At one level of analysis, the relationships among the documents shows that they are part of what might be called a “document infrastructure,” in which each document’s meaning depends upon both its formal relationship with other documents, and the social practices (tacit or explicit) that are enacted as people work in related ways with those documents. In a subtler way, the same might be said of a “role infrastructure,” in which each role exists in formal relation to other roles, and in which each role is also defined, in part, by social practices (tacit or explicit) around those roles. Each of these infrastructures assists people to coordinate their shared work, so we have begun calling them “articulation infrastructures.” It is not yet clear whether we should speak of one omnibus infrastructure, or multiple, more specific infrastructures. We will need to learn more.

CONCLUSION

Despite our need to learn more, we argue for the theoretical and practical value of our concept of landmarks as diverse, shared references with known characteristics. In terms of the three lines of thought discussed earlier, we have attempted to move from individualistic landmarks [1,3,5] to a richer representation of shared landmarks [11] in a shared place of mutual engagement and collaborative action [6]. We have attempted to take insights from the study of formal, denotatively inscribed articulation objects [13,15] in such shared places, and to extend those insights as we study similar articulations around less formal – but nonetheless structured – sets of events, roles, and persons [2,16].

We acknowledge the need for further reflection and practice with regard to this new concept. For example, how will we identify landmarks? Will they emerge as best practices? Will some landmarks occur *not* as best practices, but as historical artifacts from earlier, no-longer-valuable approaches?

At a more theoretical level, we need to clarify the relationship between landmarks and boundary objects. In the past, boundary objects have tended to be thought of as artifacts [2,13], whereas we have found landmarks in the form of artifacts *and* persons, roles, events, etc. However, it would not be much of a theoretical “stretch” to reinterpret the boundary object concept to include these other entities. Some critics of the concept of boundary objects have asked, “Well, what is *not* a boundary object?” It may be that the theoretical utility of the landmarks concept is to apply it only to those entities around which substantive coordination or articulation activity occurs.

In practical terms, we see design opportunities to aid diverse workers through (a) providing shared landmarks, or (b) providing the means for negotiating and creating those shared

landmarks; we may also find a need for (c) allowing subgroups to define restricted-access landmarks for their own constituencies (e.g., [4]). We have become more conscious of the need to make clear displays of structured collections of entities (homogeneous infrastructures), from formal documents to semi-formal roles to as-yet-poorly-defined events, so that co-workers can make sense of the components of each collection in relation to the other components of that collection (and so that co-workers can themselves structure those collections). Finally, we are actively engaged in the problem of relating multiple sets of these structured collections to one another (articulating infrastructures, or perhaps a heterogeneous infrastructure), so that co-workers can more easily discuss and represent the working relations among diverse resources in their shared activities.

REFERENCES

- [1] Benyon, D.R. (1998). Beyond navigation as metaphor. *Proc 2nd EuroDL Conference*. Crete.
- [2] Bowker, G.C. & Star, S.L. (1999). *Sorting things out. Classification and its consequences*. Cambridge MA USA: MIT Press.
- [3] Chen, C., & Czerwinski, M. (1998). From latent semantics to spatial hypertext -- An integrated approach. *Proc Hypertext'98*.
- [4] Cohen, A.L., Cash, D., and Muller, M.J. (2000). Designing to support adversarial collaboration. *Proc. CSCW 2000*. Philadelphia USA: ACM.
- [5] Dieberger, A., and Frank, A.U. (1998). A city metaphor for supporting navigation in complex information spaces. *Journal of Visual Languages and Computing* 9, 597-622.
- [6] Dourish, P., and Bellotti, V. (1992). Awareness and coordination in shared work spaces. *Proc. CSCW'92*. Toronto: ACM.
- [7] Herzum, M. (1999). Six roles of documents in professionals’ work. *Proc ECSCW'99*. Copenhagen: Kluwer.
- [8] Moran, T., “Activity: Analysis, design, and measurement.” Presented at the Symposium on the Foundations of Interactive Design, Ivrea, Italy, 12-13 November 2003.
- [9] Muller, M.J. (2004). Activity graphs of the microstructure of complex work. Poster at CSCW 2004.
- [10] Muller, M.J. (2001). Layered participatory analysis: New developments in the CARD technique. *Proc. CHI 2001*. Seattle: ACM.
- [11] Munro, A., J., Höök, K., and Benyon, D. (1999) (eds.). *Social navigation of information space*. Berlin: Springer.
- [12] Olson, G.M., Malone, T.W., and Smith, J.B. (2001). *Coordination theory and collaboration technology*. Erlbaum.
- [13] Schmidt, K. (1997). Of maps and scripts: The status of formal constructs in cooperative work. *Proc GROUP'97*. Phoenix AZ USA: ACM.
- [14] Schmidt, K., and Bannon, L. (1992). Taking CSCW seriously: Supporting articulation work. *CSCW Journal* 1(1-2), 7-40.
- [15] Schmidt, K., and Simone, C. (1996). Coordination mechanisms: Towards a conceptual foundation of CSCW systems design. *CSCW Journal* 5(2-3), 155-200.
- [16] Star, S.L. (2002). Got infrastructure? How standards, categories, and other aspects of infrastructure influence communication. 2nd Social Study of IT Workshop at the LSE ICT and Globalization.
- [17] Suchman, L.A. (1987). *Plans and situated actions: The problem of human-machine communication*. Cambridge University Press.
- [18] Suchman, L.A., and Wynn, E. (1984). Procedures and problems in the office. *Office: Technology and People* 2, 133-154.