Studying Appropriation in Activity-Centric Collaboration

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Abstract. We describe a case study of appropriation of a research prototype by a 33-member research community, leading to reinvention of the prototype and a successful transfer to product. Based on those experiences, we propose some lessons learned about designing for appropriation.

1 Introduction

This position paper contains two sections. The major section describes a case study of appropriation in an activity-centric collaboration environment. The second section proposes lessons learned about designing for appropriation in collaborative computing environments.

[1] Now in IBM Software Group,

2 Case Study of Appropriation: ActivityExplorer

We designed ActivityExplorer (AE) as the client portion of our research prototype Instant Collaboration (IC), an experiment in activity-centric collaboration. AE was used by a research community of 33 people during the summer of 2003, and helped us to define a class of computing environments that fall midway between unstructured, ad hoc collaborations (e.g., instant messaging, email) and highly structured, formal collaborations (discussion databases, teamrooms, group decision support systems). The research experiences of 2003 led to a decision in 2004 to include AE as a feature on IBM Workplace Collaboration Services, which was released in 2005 (IBM, 2005). This report goes beyond previous descriptions of the types of activities that emerged (Muller et al., 2004), and the patterns of

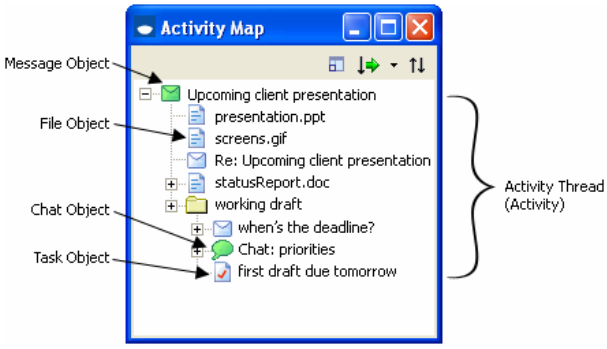

Figure 1. Activity Thread from ActivityExplorer.

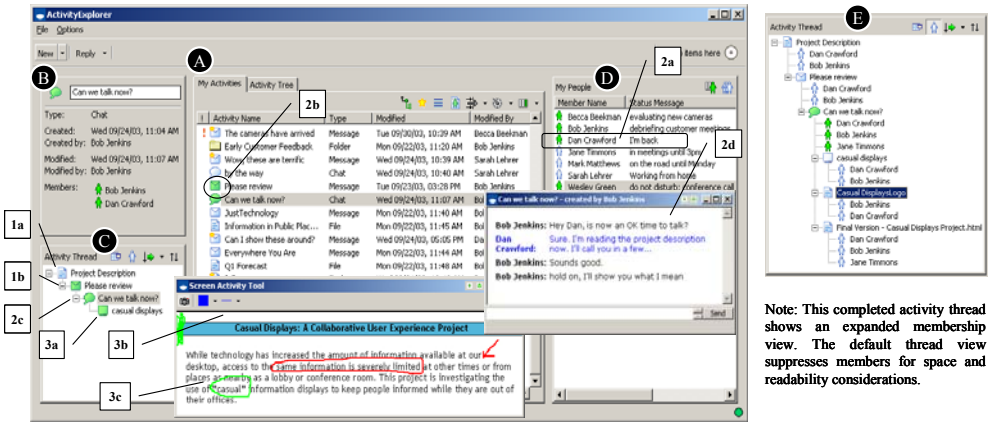

Figure 2: ActivityExplorer. A. Overall list of all shared objects. B. Details of one shared object. C. Activity Thread showing one structured collection of shared objects. D. Enhanced buddy list. E. Another Activity thread. 1a. Activity Thread, beginning with a file object. 1b. Message object, currently accessed by at least one collaborator. 2a. User with "live" online status indicated. 2b. Message object in overall list of objects, currently accessed by at least one collaborator (same object as 1b, but not shown in 2b without Thread context). 2c. Chat object, currently accessed by at least one collaborator. 2d. Chat tool with contents. 3a. Shared screen image, currently being accessed by at least one collaborator. 3b. Shared screen tool displaying shared image, currently being annotated by two collaborators. 3c. Shared screen tool contents.

media usage in the project (Millen et al, 2005), to focus on our experiences with reinvention of the prototype's usage by its users.

Figure 1 shows the basic unit of AE, namely an Activity Thread. An Activity Thread is a structured collection of objects that are shared among a group of users. Available objects in the 2003 research version included messages, files, persistent chats, shared screen images, tasks, and folders.[1] In limiting cases, an Activity thread could include only one object, or could be "shared" by only one person.

As shown in Figure 1, members of an Activity Thread use a hierarchical metaphor to structure their shared "live objects." Each object is "live" in the sense that its icon changes if someone is currently accessing it.[2] A buddy list of other users supports the more common "live names" functionality, such as indicating online presence of a collaborator (Figure 2). As a further extension of "live" functionality, we provide an alerting service. Whenever an Activity Thread was touched by a collaborator (e.g., reading, modifying, or creating new content), all members of that Thread were informed of the action via an alert message in the Windows system tray. Some of these attributes of "liveness" are similar to Dourish's "active properties" in placeless documents (Dourish 2003).

As reported in Muller et al. (2004), we had designed AE to be used by relatively small groups of collaborators, for relatively brief periods, using a handful of objects, in each Activity Thread. We had hypothesized that small, ad hoc collaborations would continue to occur in chat and email, and that large, formal collaborations would continue to occur in discussion databases. Indeed, we found 110 Activity Threads (54%) that corresponded to this pattern (2-14 objects, 1-7 days duration, a small number of collaborators).

2.1 Appropriation

We were surprised by other Activity Threads. The student interns in our group in 2003 took over AE, and made it their home environment. Led by the interns' innovations, multiple groups of researchers also began to use AE in new ways. The result was that the users reinvented AE through use (e.g., Antón and Potts, 2001; Bikson and Eveland, 1996; see also Muller and Gruen, 2005).[3]

The unanticipated usages made some AE Activity Threads into simple chat vehicles -- out of 203 Activity Threads, a total of 71 (35%) contained a single chat object (with an average of 18.92 turns per chat, median 7 turns, range 1-222 turns). Thus, despite the fact that these 71 Threads contained a single object, the single chat object contained evidence (number of chat turns) of extended

[1] The product version does not currently include task objects.

[2] In the research prototype, the liveness was signaled by color changes. In a real product that supports universal usability, the liveness would require a more accessible signal.

[3] Some of the surprising results were clearly due to interns' activities. However, most of the surprising results also involved one or more non-intern research staff members, and fully half of the longest, most surprising Threads were primarily full-time staff collaborations.

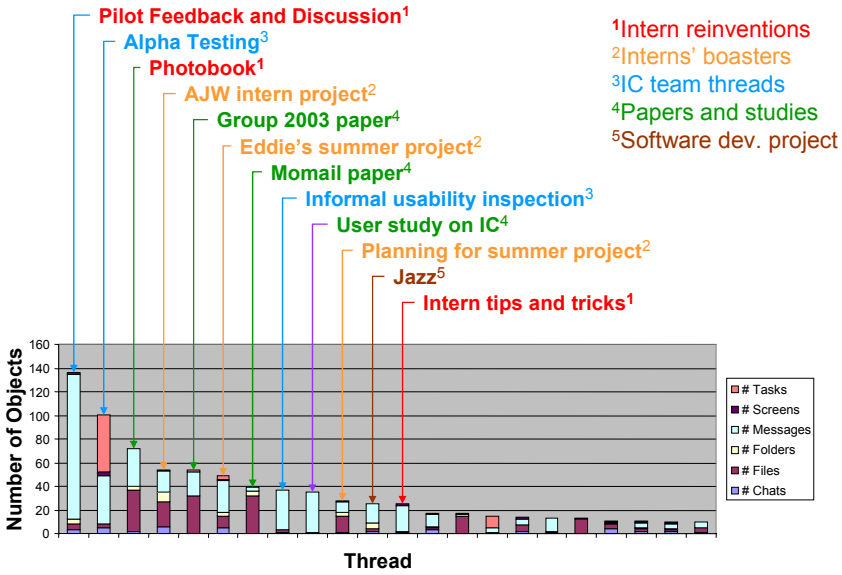

Figure 3. The large Activity Threads, with details about the 12 longest Threads.

collaboration. Other single-item Activity Threads were composed of a message object (24 Threads, 12%), a file object (12 Threads, 6%), a folder (3 Threads, 1%), a task (1 Thread, <1%), and a shared screen (1 Thread, <1%). There is not space in this position paper to analyze these non-chat objects in greater detail; briefly, we hypothesize that these were failed collaborations, in which the intended collaboration partner never responded.

The unanticipated usages also converted some AE Activity Threads into four-month community resources, as well as sites for detailed, extensive development of project contents, such as writing research papers for conferences. Figure 3 presents a summary of the longest Activity Threads. The *Alpha Testing* and *Informal usability inspection* Threads were directly related to the AE project. The *Pilot feedback*, *Photobook* and *Intern tips and tricks* Threads were examples of interns' reinvention of AE for their own community purposes. The *AJW*, *Eddie*, and *Planning* Threads were intern projects that generated large, partially archival sets of materials. The *Group 2003*, *Momail*, and *User study* Threads were researcher activities toward conference papers. The *Jazz* Thread was a researcher exploration of collaborative software development environments.

2.2 Consequences

There were several consequences of these patterns of unanticipated usage. First, AE became the default chat application for many of the interns. Some of them never loaded the IBM-standard instant message product, because their chat needs were met sufficiently through AE. Second, because the AE chats were persistent, users tended to revisit the chat transcripts (the interval between the last *write* into a chat and the last *read* of the chat was 7.55 days); some interns reported that they used the chats as reference materials for mentors' instructions in programming

projects. Third, again because of chat persistence, users tended to put informal communications into email, rather than into chat. The second and third consequences show how a simple change (chat *persistence*) can reverse the previously accepted "outeraction" hypothesis (Nardi et al., 2000) that chat is used in a preliminary and transitory manner to set up more formal, content-filled, and persistent collaborations in other media (see also Muller at al., 2003).

The fourth consequence presented difficulties. As we described in relation to Figure 2, AE supported several aspects of "liveness:" it displayed online status of collaborators (similar to instant messaging buddy lists), access status of objects, and alerts when objects in a relevant Activity Thread were added, updated, or even examined. For small groups of collaborators, the alerting feature appeared to be useful: People were notified immediately of changes to Activity Threads that were relevant to their work. However, for the larger Threads in Figure 3, these alerts became annoying and even burdensome. Many of the larger Threads had membership of all 33 people in the AE community. Any *read* of an object in one of these larger Threads would create an alert for 33 people. These community-wide Threads were not necessarily an essential part of each person's work. The result was that people were receiving apparently high-priority alerts for events that did not directly affect them. Further, we observed cases of "swarming," in which a simple *read* action by one person on an object would generate alerts to other people, who would in turn also read the object, generating further alerts in a feed-forward loop that was limited only by the number of people who were currently online. Users complained strongly about these distractions in the first research prototype of AE.

A fifth consequence will eventually present other difficulties of a more positive nature. As described above, we had anticipated that AE would be used for relatively brief, informal, non-archival collaborations. We learned that people might *begin* an Activity Thread in this manner, but that certain Threads could grow in size and importance until they contained unique project-related content of archival significance. Indeed, part of the strength of AE was that an informal collaboration could begin in a chat or a message, and could grow into a larger body of materials, eventually becoming important project records –*within the unitary AE environment*. By contrast, in more conventional work environments, users might begin the informal collaboration in a chat or email environment, and then *copy* their materials into an intermediate-scale collaboration environment such as a discussion database, and then *copy again* their growing body of resources into a content management system. Thus, the flexibility of AE – its ability to support the reinvention described in this paper – became a major strength and "value proposition." However, the use of AE for potentially archival records paradoxically highlighted its weaknesses in exactly those areas: the research prototype of AE had no mechanism for managing content over long

periods of time. The research prototype of AE had become more valuable than anticipated, and its value had outpaced its ability to manage that value.

The sixth consequence was also a direct outgrowth of the appropriation. The ability of AE to support multiple styles of work – highly informal, semi-structured, as well as archival – led to the adoption of AE as a feature of IBM® Workplace™ Collaboration Services product in its release 2.5, made public during the summer of 2005 (IBM, 2005). The reinvention and appropriation that we experienced contributed to the successful technology transfer of a research prototype into a product feature.

3 Designing for Appropriation

A number of research programmes have focused on the strategic use of ambiguity to foster appropriation and reinvention by users. Our work has learned from that tradition, and has applied some of its lessons in the provision of what might be called open-ended tools for work. Unlike work with cultural probes (Gaver et al., 1999) or related, deliberately ambiguous objects (Boehner et al, 2005a; Kaye et al., 2005; Sengers et al., 2005), our work begins with an anticipated context of use – somewhat more similar to the investigations of Dourish (2003) and Boehner et al., (2005b). Further, our work must have immediate use potential as perceived by its end-users; otherwise, in our organizational environment, there will be little usage and insufficient experience to lead to appropriation or reinvention. While we appreciate the importance for critical reflection on potential techno-centric values that may infiltrate design (Boehner et al., 2005a; Sengers et al., 2005), in our domain we continue to assume at least a subset of those techno-centric values.

In a somewhat more techno-centric manner, Dourish considered diverse experiences with appropriation (1999, 2003). He noted (1999) five aspects of appropriation, which are strongly tied to our results. *Flexibility* of technology was key, and indeed AE provided flexible means for representing relationships among objects. In Dourish's experiences, appropriation generally occurred in a *community*, and as we observed, the interesting aspects of AE arose as a community *incrementally* redefined how it was used, made those redefinitions *visible* to members of the community, and thus redefined what AE "was." Finally, the community's redefinition of AE left visible traces, and the *persistence* of these traces allowed both further reflection and appropriation, and our ability, as researchers, to study the phenomenon. Similarly to Dourish's (2003) description of the Placeless paradigm, AE offered the ability to co-create structures of diverse materials that would have been managed separately by traditional, media-specific applications.

However, our approach provided very little of the multiple levels of taxonomy that Dourish's placeless environment afforded. It appeared to us that the success of AE depended precisely on the co-construction of the *same* shared structure to

organize the shared resources. In this way, or experience differed from some of the attributes that Dourish (2003) found crucial for the success of placeless: multiple dimensions along which to organize information, user control of document behavior, and relaxation of requirements for the *same* organizational structure to achieve mutual intelligibility. When the interns – and later the researchers – transformed AE from a small-scale, transient collaboration environment into a flexible place for small and large, informal and formal co-constructions, their use appeared to depend crucially on having exactly the same representation for all users.

Also in a more techno-centric manner, we look to Pipek's accounts of appropriation in a work context. Pipek (2005) mentions several aspects of tailoring support that resonate with our users' experiences: articulation support (knowledge of who is doing what, and with what completion status), demonstration support (through shared screens). However, Pipek did not observe a crucial aspect of our experiences: the co-construction of structures for articulation support – i.e., the piecemeal, object-by-object joint creation of the structure of shared resources (e.g., as shown in Figure 3). Interestingly, much of what our users accomplished was done without focused discussions (e.g., Pipek's concept of "use discourses"). Because our users were using AE primarily in order to do other work (work that was not "about" AE), it appears to have been an advantage that they could co-construct their resources without needing to engage in a focused dialogue about the tool itself. These experiences are in strong contrast with Pipek's research, and with many of the tailoring and appropriation studies that he surveyed in his thesis.

Based on these comparisons, we offer the follow additions to the preceding advices, observations, and conceptions of design for appropriation.

- **Changing reference systems** – Users tended to move their focus from informal dyads, to small teams, to large communities. They appeared to do so fluidly, without needing to establish or declare the scope of their frame of reference.
- **Graceful adaptation to changing size and membership** – In consequence, AE needed to be able make graceful accommodations to these changing reference systems. AE was successful in providing an informal "growth path" from small, informal, ad hoc, to large, formal, and archival. The research prototype of AE was unsuccessful in accommodating the different notification, liveness, and archiving requirements of these different reference systems.
- **Changing usages and valuations** – We observed distinct changes in the usage (and hence, the meaning) of certain media. The strongest case was the transformation of instant messaging from a transient, assistive technology (the outeraction hypothesis) into a medium that itself

contained valuable records that people referred to an average of a week after they were inscribed.

- **Inversions of importance** – As AE collaborators worked out their new usage patterns, the importance of different media changed. The strongest example is the inversion of importance and formality that occurred between chat (more formal, more public in AE) and email (less formal and more private, by comparison).
- **Increased requirements for user control** – As AE became more a part of collaborators' work, their need to control its attributes increased. We saw this most clearly in users' experience of being overwhelmed by alert notifications, but we also learned of a number of other desirable user control features that we are still working on.

We look forward to comparing our experiences with those of others in the workshop. We hope develop a better understanding of which aspects of appropriation are more important in different settings, depending on technology, environment, and most crucially shared practices. Ultimately, shaping the use and meaning of technology is part of individual and collective democratic practice, and should become one of the formative phenomena for HCI in the 21st century.

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