Synchronous Broadcast Messaging: The Use of ICT

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ABSTRACT

IBM Community Tools (ICT) is a synchronous broadcast messaging system in use by a very large, globally distributed organization. ICT is interesting for a number of reasons, including its scale of use (thousands of users per day), its usage model of employing large scale broadcast to strangers to initiate small group interactions, and the fact that it is a synchronous system used across multiple time zones. In this paper we characterize the use of ICT in its context, examine the activities for which it is used, the motivations of its users, and the values they derive from it. We also explore problems with the system, and look at the social and technical ways in which users deal with them.

Author Keywords

Broadcast messaging, CMC, CSCW, chat, instant messaging, IM, social computing.

ACM Classification Keywords

H.5.3 Group and Organization Interfaces

INTRODUCTION

Imagine that you are working at your computer, and you suddenly hear a soft 'ding', followed by a tiny window sliding in from the corner of your screen. The window contains a question, which you read and ignore, and a few seconds later the window slides out of view. Ten minutes later it happens again: a new question slides out with its accompanying ding. And again half an hour later.

This is an experiential description of what it is like to be a user of "IBM Community Tools" (ICT). ICT is a computer mediated communications system used within IBM. Well over 13,000 users log on to the system every work day, using it to send and receive "broadcast instant messages."

As researchers who study and design computer mediated communication (CMC) systems, we are intrigued by this system, and by the fact that it is prospering 'in the wild,'

three years after its release, even though it is not officially supported. Why is it so popular? What is it used for? How is it used? What value does it provide? Why do its users tolerate the 'dings?' ICT is also interesting because message broadcasting is rare in synchronous CMC, and has not been reported in use across multiple time zones. Our interest increased when a month long shutdown of ICT produced a fervent outcry, with claims that ICT was irreplaceable and fulfilled critical business needs.

We begin with a description of ICT, and situate it with respect to other CMC systems. Next, we describe our methods, which combined automated logging, interviews, and user surveys. We then present a profile of ICT's general usage, and examine its purpose, value, and users' motivations. We conclude with a general discussion of ICT and synchronous broadcast messaging.

THE IBM COMMUNITY TOOLS SYSTEM

ICT is deployed at IBM, a large company with over three hundred thousand employees, and offices worldwide. IBM's activities are wide ranging, but are primarily concerned with the development and provision of information technology systems, services and support. IBM's employees often work in distributed teams, and are quite mobile: it is estimated that on most work days nearly a quarter of IBM's employees work from a temporary work site such as a hotel, a client's office, or home.

ICT is a set of tools built to take advantage of a synchronous messaging infrastructure. Its core component is an advanced instant messaging client; however, ICT also contains a novel suite of tools that enables users to broadcast messages to groups of other users. ICT is actually a prototype system that, as part of an effort to encourage the exploration of new technologies, is available for download by all employees. As a prototype, it is not supported by IBM's support organization, thus making its adoption by tens of thousands of users a bit surprising.

The ICT broadcasting suite is simple in concept. Any user can create a channel – called a "community" in ICT parlance – by giving it a name and short description. Any user may subscribe to any public community (there are also private communities). Newly created communities are displayed when a user logs in, and users can modify their subscriptions at any time. Examples of communities include *Java Programming*, *Comic Geek* (for comic book
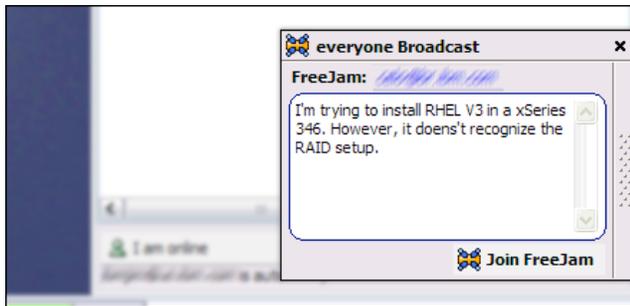
Figure 1. ICT Broadcast: a 'slide out' invitation to a FreeJam (sender ID blurred for privacy)

Figure 2. ICT FreeJam in progress (IDs blurred for privacy)

enthusiasts), *Grammar–Punctuation–Style* (for writing assistance) and *Unix Questions*.

When a message is broadcast to a community, all users subscribed to that community (and logged on) see a small window slide out from the corner of their screen, accompanied by a 'ding'. After a few seconds, the window disappears. Figure 1 shows what a broadcast message looks like. It is the most common type of broadcast: an invitation to join a group chat, known as a "FreeJam". Here, the sender (ID blurred for privacy) has sent a technical question about an installation to the *Everyone* community (which doesn't actually contain everyone, only about 7,000 users).

Figure 2 shows the FreeJam window that appears after clicking on "Join FreeJam". Eight people have joined (including the sender), three of whom are offering advice: one suggests a version of Linux to use, another promises to provide a URL, and the third says that he has experienced a similar problem and asks for more detail, which the sender then provides. The others who have joined have not yet spoken, and may very well say nothing. Selecting the ID of any of the participants (right-hand pane) displays that person's picture and job title from the corporate directory.

An ICT broadcast can be of one of four types: a FreeJam, a SkillTap, an Instant Poll, or an Alert. A SkillTap is similar to a FreeJam, except that it initiates a one-to-one chat instead of a group chat; i.e., each respondent is put into a separate one-to-one chat with the sender. In an Instant Poll, the sender specifies a question, such as "Which browser do you use?", and a set of possible answers. Respondents choose an answer, and then see a summary of others' responses (responses are anonymous, and do not include a chat). Finally, Alerts do not allow any response: they simply contain a message, with an optional clickable URL. Regardless of type, broadcast senders are always identified, and can be instant messaged by clicking on their ID.

The ICT system has a variety of other features, but for the purposes of this paper we focus solely on the use of the ICT broadcast suite. What is interesting here is the combination of two simple types of functionality, message broadcasting to groups and mechanisms for small group or one-to-one interaction, and how this plays out in the context and constraints of a large distributed organization.
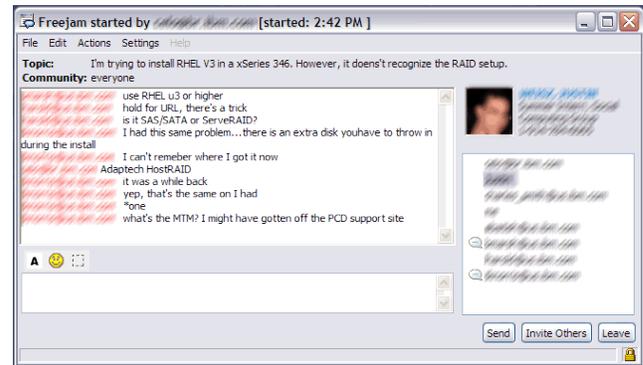
RELATED SYSTEMS AND RESEARCH

ICT sits in an interesting interactive niche. It is unusual in that it uses broadcast to large distributed groups – functionality most commonly found in asynchronous applications – to initiate synchronous interactions among small groups. We first touch lightly on research on asynchronous and synchronous applications, and then examine other synchronous broadcast messaging systems.

Broadcast messaging is a well-known mechanism used by email, distribution lists and newsgroups. While it is among the most successful genres of CMC, particularly in organizations [19], it has a variety of problems. These include social problems, such as flaming, lurking and other forms of free riding [12,15,19], as well as problems of overuse and information overload due to the ease and low cost of use [13,20]. While various approaches have been explored with regard to reducing overload (see [4,11] for examples), it continues to be a problem [3].

Similarly, the synchronous components of ICT – the one-to-one chat sessions invoked by SkillTaps and the group chats invoked by FreeJams – are also well known. A number of researchers have studied the use of instant messaging (IM) in the workplace. For instance, Nardi et al. [14] note the use of IM for short questions, coordination, and negotiating longer interactions, and Isaacs et al. [9] note some similar uses, but suggest that IM's primary use is for complex work tasks. In both cases, the dominant use of IM is for tasks that involve coworkers, friends, or others who know one another. Nevertheless, the costs associated with frequent interruptions have been well documented [16,17], and have spawned a variety of approaches to understanding and managing interruptions [5]. Synchronous *group* chat – at least in the workplace – has been less studied. Group chat applications for the workplace tend to have some element of persistence and thus can support either synchronous or asynchronous use. Examples are Rear View Mirror [8] and Babble [6], both of which appear to have been primarily used by groups whose members know one another.

We are aware of only two other systems that combine broadcast with synchronous group chat: ReachOut and

Zephyr. ReachOut [10,18] was designed to support question asking and answering, and works by broadcasting questions to a set of people who match a profile. Questions appear in a list on the user's screen; selecting a question takes the user into a chat room that persists for three days after the last comment was made, after which the chat vanishes.

ReachOut resembles ICT in its model of using broadcast to invite a group of users into a chat space. Although ReachOut has ambitions of using response history, etc. to dynamically select who receives a particular broadcast, in its implemented form it simply broadcasts to all those in particular categories. ReachOut, like ICT, is designed for a corporate context, and fully identifies its users. However, ReachOut differs from ICT in several ways. First, it is less synchronous: users need not be logged on to see a question, and they have quite a long time (days) to respond to questions. Also, in practice, ReachOut's semi-persistent chats are more often asynchronous than synchronous. Finally, the channels in ReachOut appear to be predefined, whereas ICT allows users to create new channels.

Zephyr [1] is, in its design and mode of use, closest in spirit to ICT. Like ICT, Zephyr allows users to create and subscribe to channels. A channel member can broadcast a message, and all channel members logged on at the time will see it, and have the option replying. Like ICT, Zephyr is synchronous and ephemeral: users who are not logged on miss broadcasts that appear in their absence, and, in practice, if a Zephyr broadcast does not receive a response in a few minutes, it is unlikely that it will get one. Like ICT and ReachOut, Zephyr users are identified by their IDs. Zephyr differs from ICT in the way it handles responses to a broadcast. In Zephyr, responses are seen by all users subscribed to the channel. In ICT, responses are seen only by those who respond to (i.e., join) the broadcast. Thus, Zephyr discussions are more public than those in ICT.

Finally, the *studies* of Zephyr and ReachOut differ from ours in that both focus on smaller, more homogeneous populations. The Zephyr study [1] looked at its use at MIT, among students who were collocated on campus, and focused on a single channel, the Help Instance. ReachOut was deployed to a research group (largely collocated) [10] and a single sales organization (largely distributed) [18] at IBM. User group size ranged from a few hundred with ReachOut to about five hundred with Zephyr. In contrast, ICT's user population and activity is at least an order of magnitude larger, an important factor given the potential disruptiveness of large-scale synchronous broadcasts.

METHOD
ICT usage data were gathered using three methods: activity logging, interviews, and surveys of users.

Logging: The System Log and the User Activity Log
There were two sources of log data: the ICT system log, and the user activity log. The system log, automatically generated by ICT, provided information only about users'

logins and community subscriptions. To track finer grained user activity, we developed a bot that logged all ICT broadcasts for 64 days (hereafter referred to as the nine-week logging period). For each broadcast sent to a public community, the bot logged the time, the sender's ID, the message that was sent, and the community to which it was sent. In addition, the bot joined each FreeJam group chat, and logged when people joined and left the chat, and when they spoke; for technical reasons, the bot was unable to log responses to SkillTaps, Instant Polls or Alerts.

Owner Interviews
Because it took some time to develop the bot, we began our study with interviews. We interviewed community "owners" – people who had created a community – because we thought they were likely to be active users of ICT. We first conducted five pilot interviews, during which we refined our interview protocol. Next, we sampled the top 100 most subscribed to communities (from ICT's system logs), and interviewed five owners from that set. Once the bot provided us with a few weeks of user activity data, we sampled the top 100 most active communities, and interviewed five more owners. Most interviews took about half an hour and were done via phone; an observer took notes during the interviews, and the interviews were recorded and later loosely transcribed.

Two Surveys: Of 'Active Users' and 'Recent Senders'
As we carried out the interviews, we began developing survey questions to validate, quantify and generalize our findings to other ICT users. For example, comments about the value of ICT in the interviews were used to generate a checklist of values for the survey. Survey content ranged from asking for reports of behavior, inquiring about underlying norms, and probing attitudes and beliefs about the value of ICT. The questions themselves were a combination of statements with Likert scale agree-disagree responses, multiple choice and short answer questions.

The use of surveys as a data collection method has a number of well-known shortcomings: they rely on their subjects' memories, often require subjects to generalize across instances, and are better at uncovering beliefs than behaviors. We took two approaches to mitigate these problems. Across two surveys, we had respondents answer questions with respect to a single community, and with respect to a specific message that they had broadcast in the last 24 hours. We also triangulated among data sources when possible (e.g., we correlate respondents' reports of their usage with log data).

The 'Active Users' Survey: On the Use and Value of ICT
The first survey consisted of about 40 questions and took about 15 minutes to complete. It was aimed at assessing the general use and value of ICT, and was targeted at a random 4% sample of people who had either sent a broadcast or responded to a broadcast (by joining a FreeJam) during July (196 people). We refer to this set of users as *active users*.

This survey contained two sets of questions: one that asked *active users* to select a single community in which they participated, and to answer questions about its purpose, composition, leadership, etc.; and a second that asked them to generalize across their use of ICT (usage patterns, motivations, value, etc.). As we targeted users active in ICT to ensure that they had relatively recent experiences with broadcasts, our conclusions cannot be generalized to prospective or inactive ICT users.[1]

The 'Recent Senders' Survey: On Q&A and Value of ICT
The second survey sought more information on question asking and answering, and repeated some questions from the first survey. To reduce biases due to generalization and retrospective response, it asked each recipient to respond with respect to a broadcast he or she had sent in the last 24 hours (a copy of which was included). Batches of survey invitations were sent out once a day from Tuesday through Friday for one week (to avoid a memory bias from the weekend, we did not send out surveys on Saturday). The survey contained 28 questions and took about ten minutes. We did not include users who had received the first survey, or who had received the second survey on a previous day; nor did we include those who sent an Alert, which does not allow users to respond, and thus cannot be used for Q&A. We refer to this set of respondents as *recent senders*.

RESULTS AND DISCUSSION

The approaches described in the previous section produced a large quantity of data. In addition to the fifteen owner interviews, the two surveys produced 69 and 93 responses, respectively, for response rates of 35% and 51%. The ICT system logs contained a vast amount of data, and the bot logged over 5,300 broadcasts during the nine-week activity logging period. While sporadic failures of both the bot and the ICT system logger resulted in occasional data loss, to the best of our knowledge these losses were random, and represented a very small portion of activity.

Because of the variety of data sources, and the differing methods and samples used in this study, we combine the presentation of results with their discussion. We begin with a profile of ICT that depicts the scale and extent of its use, and then move on to its other aspects.

A General Profile of ICT Use

The ICT system log indicates that it is a popular and consistently used application. Figure 3 shows five months of daily login behavior (ICT allows users to set up auto-login). The mid-April dip is due to a partial shutdown of the system (including the broadcast suite) due to server infrastructure problems. When full functionality was restored after a month, users were required to download an
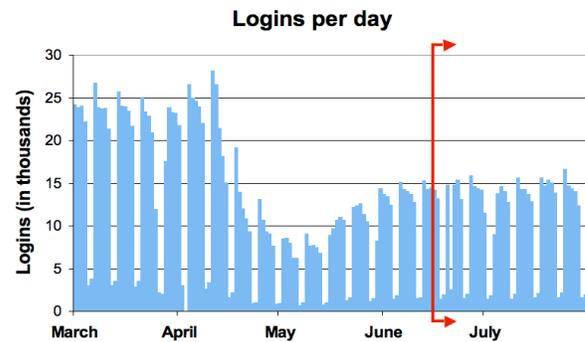

Figure 3. Number of users logged in per day. The line shows the start of the user activity log.

updated version. About 60% did so and began using it again, suggesting that ICT fills an important niche for many users. It also indicates that even if auto-login is responsible for the consistency of use, users do want to use ICT. Certainly, ICT continued to see large scale, regular usage after the shutdown. For example, during July, nearly 29,000 unique users logged in to ICT, with an average of about 13,500 users each work day, and about 1,600 on weekends. While some of these only used the instant messaging client, 27,129 (95%) made use of ICT broadcast functionality by subscribing to at least one community.

Regarding overall user activity, users subscribed to a median of 4 (M=9, SD=21) communities, and about 75% subscribed to at least one community not in the set of default subscriptions.[2] During the nine-week logging period, a total of 1,843 distinct users sent 5,310 broadcasts to 422 public communities.[3] Of the broadcasts sent, 46% were FreeJams, 26% were SkillTaps, 21% were Alerts, and 7% were Instant Polls. Thus, nearly three quarters of the broadcasts were used to invite others to chat sessions (many-to-many in FreeJams, one-to-one in SkillTaps). Finally, a total of 5,799 unique users joined FreeJam chat sessions, many of whom joined multiple FreeJams.

Activity on an average day appears more moderate. Although well over 10,000 users log into the system each work day, only about 112 broadcasts are sent on work days, and weekends experience less than a tenth of this amount of activity. A median of 317 (M=277, SD=199) distinct users respond to FreeJams on a given day; but since many people join more than one FreeJam, the typical FreeJam has 9.26 participants (SD=13.46), 3.62 (SD=6.0) of whom chat, and

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[1] This survey was also sent to a sample of 4% of users who had unsubscribed from all communities. Due to a low response rate (N=15) we say little about this set of results.

[2] New ICT users are subscribed to four communities by default: *IBM Community Tools Test*, *ICT Outages*, *New Users*, and one 'private community' for each user that lets him or her send test broadcasts without disturbing others.

[3] Approximately 900 public communities were in existence during the logging period; a graph of activity across communities shows the familiar power-law curve exhibited by most genres of CMC.

6 (SD=8.55) of whom are silent. Thus, from this perspective, it seems that ICT users are highly inactive.

To get a feel for the level of activity experienced by an individual, we consider the *Java Programming* community. *Java Programming* is a relatively large and popular community, with about 1,350 subscribers, and 262 active users during the activity logging period. Members sent 64 FreeJams, and on average, each FreeJam was joined by about 8 users, contained about 21 chat messages, and lasted about 10 minutes. Members of *Java Programming* also sent 33 SkillTaps, 4 Instant Polls, and no Alerts, for a total of 101 broadcasts of all types, or around 2 per work day.

The Purpose and Value of ICT Communities
The first portion of the first survey asked respondents to pick a single community in which they were involved, and answer some questions about it. We were surprised by the diversity of the communities chosen: the 56 *active users* who responded to this section of the survey named 41 distinct public communities, only 4 of which were chosen by more than one person. The great majority said that their community was either about work related issues (71%) or about both work and non-work related issues (20%). Because respondents might have been biased towards reporting on work related communities, we repeated the question in the general section of the survey and got similar results: the *active users* said that 73% of all their community subscriptions were work related, and 11% were for communities that were a mix of work related and non-work related topics. Finally, the second survey, which asked about individual messages, had a similar response pattern: 84% of the messages sent by the *recent senders* were classified as work related, and 10% related to both work and non-work. Thus, by all three measures, ICT communities seem strongly focused on work related issues.

That said, non-work communities are not entirely absent from the picture: 7% of the communities on which the *active users* reported, and 6% of the communities to which the *recent senders* sent their broadcasts, were said to be about non-work issues. When we randomly sampled the 100 most active and 100 most subscribed to communities to find interview candidates, a number of non-work communities turned up. These included a religious community, a role playing games community, and a group of comic book enthusiasts. Other communities were more difficult to classify, including one that served as a clearing house for discounts available to IBM employees, and another for advocates of the Firefox web browser.

From the interviews, we compiled a list of values that ICT provides to its users. Overall, *active users* agreed (strongly or otherwise) that ICT communities: provided business value (90%), personal value (81%), helped them connect with other employees (68%), helped them do their jobs more quickly (65%), and enabled them to meet other employees around the world (45%) (we discuss the topic of social ties in a later section). We also asked *active users*

about their attitudes toward non-work related communities: 51% agreed (strongly or otherwise) that non-work oriented communities provided value to IBM, with another 32% remaining neutral. Positive respondents commented that non-work communities could relieve stress, increase creativity, support teleworkers and enhance "work-life balance" (an ethos promoted by IBM). Similar rationales came up in the interviews: "*The social aspect of it is that a lot of people work from home. We can't look across the cube, talk to somebody*" (I13) and "*A person's workplace is more then just a job ... we spend a great deal of our lives here and there's so much to us as people*" (I8).

The Nature of Activity in ICT Communities: Q&A
A natural question to ask is what was all this activity about? In the first survey, when we asked how communities were used, 74% of *active users* said their community was used for asking questions and getting answers. The next most frequently cited uses were "making announcements" (20%), and "polling or voting on things" (17%). For example, in the *Java Programming* community, questions ranged from "How to handle accents in recipients email address?" to "Other possible causes/things to check for java.lang.IllegalAccessError - referenced class is public with public methods - deploying on a WAS 5 server, class in jar within classpath."

The emphasis on asking and answering questions was mirrored when *active users* were asked about the kind of value their community provided. *Active users* specified two kinds of value: getting answers to technical questions (71%) and to general questions (58%). Substantial minorities also cited getting answers in a time critical situation (29%), knowing that other employees shared their passions (26%), and getting answers in customer facing situations (16%). Similar issues were raised in the interviews: "*When I'm in trouble... when you are at a customer site and you have a specific technical issue, technical problem, you know you can rely instantly on a huge community... It happened quite often that I was asking something ... and I was able to get the people working in the labs, and getting their direct support in a very effective way. ... In this specific community there is a lot of participation from people in India. I suspect this is because there are probably some competency centers in Bangalore...*" (I4).

Q&A Practices
Because both the interviews and responses to the first survey indicated that question asking and answering was a dominant use of ICT, we designed the second survey to explore this issue in more depth. We wanted to understand what people did, if anything, before sending out their question, why they decided to target a particular community, and what they did if the response to their question wasn't satisfactory.

In the interviews, it was clear that some owners felt that there was a norm that people should try to answer their own

questions by other means, before sending a broadcast. To see if this sentiment was shared by non-owners, we asked the *recent senders* if they actually did this in practice: 88% said they had, citing methods such as asking colleagues (50%), searching the web (44%), and using Question Search[4] (26%). Further, 33% cited other methods not included in our list of choices, such as attempting to fix the problem without assistance, asking through official help channels, and using communication tools other than ICT.

Having decided to ask a question using ICT, how do people choose which community to send it to? The second survey confirmed our intuitions: 77% of *recent senders* reported choosing a community appropriate for their message topic, and 39% reported choosing a community with a lot of people present in it. Interestingly, only 13% said they had subscribed to a community specifically to ask their question, suggesting that people restrict themselves to those communities to which they are already subscribed.

Regarding the content of the chat sessions, 64% of *recent senders* reported receiving direct answers in response to their broadcasts. However, other responses included being directed to a document or resource such as a web page (25%), and not receiving any answers at all (23%). All 93 *recent senders* reported that the chat sessions included greetings or other social talk, and 54% reported that the chat sessions included questions about the broadcast message (e.g., requests for clarification). At the conclusion of a chat session, ICT users have several options for preserving their response: 29% of the *recent senders* reported saving the full transcript of their chat session (either automatically or manually), 9% reported copying and pasting portions of their transcript, and 58% reported not saving any part of their transcript.

In the first survey, 55 *active users* answered a question about their satisfaction with the responses to their broadcast messages. Of these users, 67% reported satisfaction with their responses. To compensate for memory and generalization problems, we asked the same question in the second survey. Here, when asked about the response to the specific message they broadcast, *recent senders* reported slightly lower levels of satisfaction: 51% were satisfied with the response to their message, 16% were neutral, and 28% were dissatisfied (5% reported N/A or didn't respond). The discrepancy between the satisfaction rates reported in the two surveys – 67% vs. 51% – might be explained by the fact that unsatisfied *recent senders* didn't necessarily give up on ICT: 54% reported that they had or would try the same ICT community at a different time, and 27% reported that they had or would try a different ICT community. Thus, subsequent success might increase their general satisfaction with ICT. Further, 77% of the unsatisfied *recent senders* also said that they had or would try to answer their

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[4] Question Search is a tool for searching for responses to previous SkillTaps.

question through other, non-ICT sources, thus indicating that users did tend to care about getting answers to their questions.

The Social Structure of Communities

We also asked a number of questions about the structure of interaction within ICT communities. In the first survey, only 4% of *active users* said that their community had a leader; the others said it did not (52%), said they didn't know (25%), or didn't say anything (19%). This is in line with the interviews: none of the community owners felt that they were a leader of their community. As one owner said, "*it's really just a free floating entity.*" (I11).

We also tried to assess the degree to which members of a community recognized one another. Recall that one of the reasons why ICT is valued by its users is because it helps people meet each other, even if they are located around the world. To assess the degree to which members of a community recognized one another, we asked about who tended to *send* broadcasts: 39% of *active users* reported that they came from different people every time, and 19% said they came from a core group of regular participants (17% didn't know, 19% didn't respond to this question, and 6% gave alternative answers). With regard to who *responded* to broadcasts, 20% of *active users* said responders were different people every time, 26% said responders were sometimes familiar and sometimes not, and 13% said responders came from a core group of regulars (22% didn't know, 19% didn't respond). The second survey, which repeated this question with respect to a particular message, produced a similar pattern but more weighted towards the "stranger" end of the spectrum: of the 82 *recent senders* who received responses to their FreeJam or SkillTap, 23% said the responses were from mostly unfamiliar people, 11% said they were sometimes familiar and sometimes not, and 11% said the responders were from a core group of regulars (29% reported N/A, and 26% didn't know). Both surveys suggest that around half of the 'faces' involved in ICT interactions are unfamiliar, in that respondents either didn't recognize them or didn't know.

Of course, this doesn't mean that the communities lack all social ties. The above results make it clear that familiar people are sometimes noticed, and this is particularly notable because of the relatively low level of activity: the top 10 most active communities received an average of only 4 broadcasts each day. To explore this issue, the first survey probed the extent to which interactions in broadcast communities lead to the development of personal bonds between employees. In response to a question about whether an encounter in a FreeJam or SkillTap had lead to private communication, 49% of *active users* said it had: 42% communicated via IM, 35% had added a person to their buddy list, 30% talked by email or phone, and 6% subsequently met face to face.

The tendency of ICT to lead to the formation of relationships was also mentioned in the interviews.

Sometimes this simply served to advance work: "*You start recognizing the names and you put that name aside and the next time you have a question you don't ask the whole group but just ask that one guy cause he really seems to know what he's talking about*" (I11). Other times, the relationships grow beyond work related matters. As one interviewee (based in Italy) said: "*A sort of relationship that was at the beginning just a job one, started to also become something different. This specific colleague came here in Italy with his family and I am probably going to UK with my girlfriend next year. So actually it's not a question of just job, it's a question of human relationships.*" (I4).

Motivations for Participation

From the first survey, it seems that responding is not a huge burden: of the 55 *active users* who answered a question about responding frequency, 71% reported responding occasionally, and 16% reported responding rarely or never. Only 13% characterized themselves as frequent responders. Figure 4 shows the average FreeJam response rate: the top 10% of responders joined an average of about 18 FreeJams (about 2 per week during the logging period), the next 10% joined about 6, and so on. Even the most enthusiastic, the top 1%, joined only about 1 FreeJam per work day. By any measure, response activity is relatively light, yet appears to be sufficient: as already noted, 67% of the *active users*, and 51% of the *recent senders* reported being satisfied with the responses they received.

However, given that communication in ICT communities is mostly among strangers – users mostly do not recognize the people who send broadcasts, and only sometimes recognize those who respond – why do they bother to respond at all? The first survey asked *active users* about why they responded; three of the top four motivations listed were altruistic: 66% of *active users* said they responded because they like to help others, 65% wanted to share their expertise, and 48% believed that "it is fair to help others since they will help me". Of course, these numbers may be a bit high, as respondents may be prone to provide reasons that put them in a favorable light. In the second survey, we asked *recent senders* about why they thought *other* people were motivated to respond to broadcasts, and they reported a similar pattern of responses. Finally, looking at the user activity logs, of the 885 distinct people who sent FreeJams during the nine-week logging period, 41% did not join any FreeJams. Clearly some free riding is going on, although senders who did not join FreeJams may still have responded to SkillTaps or Instant Polls.

The only highly ranking non-altruistic motivation was "to learn things", cited by 49% of the *active users*. As one owner said, "*Usually there are some questions which are interesting, so I just join because I ought to know the answer, right?*" (I10). This seems like a sensible non-altruistic motive to join a FreeJam, and is consistent with the observation that, on average, 6 people join a FreeJam, but say nothing.
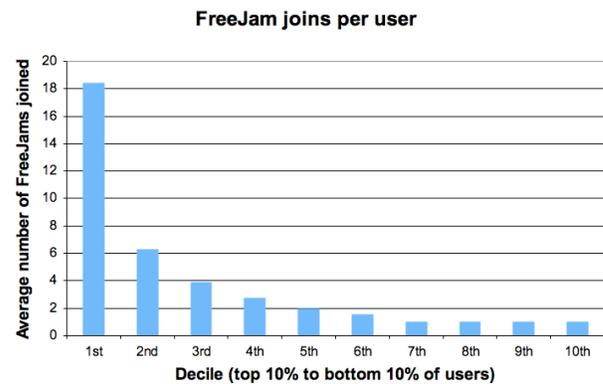

Figure 4. Average FreeJam joins per user over 9 weeks

The Costs of ICT Broadcast Communities

So far, we have focused on the positive aspects of ICT. However, it is also the case that ICT has problems that its users need to deal with. Two problems were mentioned frequently in the interviews: one had to do with the interruptions caused by the arrival of broadcast messages (with their 'dings' and slide-out windows), and the other with the use of ICT to broadcast inappropriate messages. Frequently these were entwined, with a common story being an account of a broadcast 'storm' of inappropriate messages, causing people to either unsubscribe from communities, or jettison ICT as a whole. The owner of one community said, "*One of the problems I had* [when he first installed ICT] *was the amount of useless chatter going on… people asking stupid questions… somebody would ask a stupid question and then there would be a lot of angry answers going back and forth…*" (I12). As a consequence, the first survey contained a number of questions devised to explore these issues. Rather to our surprise, neither interruptions nor inappropriate use turned out to be as great a problem as we anticipated.

Interruptions

In the first survey, we asked *active users* how frequently they were annoyed by ICT broadcasts. The most frequent response was "rarely" (42%), followed by "occasionally" (32%) and then "never" (17%). Asked if interruptions were a significant problem, only 15% agreed (strongly or otherwise), 58% disagreed (strongly or otherwise) that they were a significant problem, and 25% were neutral.

We see three reasons why the potential disruptiveness of ICT is not seen as a problem by those we studied. First, 72% of *active users* reported having used at least one of four ICT mechanisms to control interruptions: a "do not disturb" setting that temporarily blocks all broadcasts (35%), a filter that blocks broadcasts with user-settable key words (25%), unsubscribing from one or more communities (42%), and simply turning off ICT (26%). A second possibility is that the dings and slide out window used in ICT broadcasts are just not that annoying. In a question in our first survey, 80% of the *active users* agreed (strongly or otherwise) that it was easy to ignore ICT broadcasts if they

were doing something else, and only 9% disagreed. A third possibility is that perhaps it is annoying, but only to some users. Users who have a low tolerance for interruption could have already left ICT. As ICT is not used for official business processes, those who find it too disruptive can put it aside. Some evidence consistent with this possibility comes from a version of the first survey sent to users who had unsubscribed from all communities (see footnote 1). To contrast the responses of the 15 *unsubscribers* with those of the *active users*: 66% (*vs*. 15%) agreed, strongly or otherwise, that interruptions were a problem for them: 13.5% remained neutral (*vs*. 25%), and 20.5% (*vs*. 58%) disagreed, strongly or otherwise. In a similar shift, with regard to finding ICT easy to ignore if they were doing something else, 54% (*vs*. 80%) agreed, strongly or otherwise, and 47% disagreed (*vs*. 9%), strongly or otherwise. While we don't feel confident in basing conclusions on such a small response, the trend is consistent with a departure of more interruption-sensitive users.

Inappropriate messages

With regard to how often *active users* saw inappropriate messages, the dominant response was "rarely" (39%), but 30% said "occasionally" and another 14% said "frequently". Asked if they were a significant problem, 58% disagreed (strongly or otherwise), and 25% were neutral. In line with statements in the interviews, 56% of *active users* felt that a few 'mega communities' – such as *Everyone*, *New Users* and *ICT Community Tools Test* – were responsible for the majority of inappropriate messages. One interviewee noted that there would be occasional flurries of jokes broadcast to *Fun and Frolic* from India, which, while sent late Friday afternoon Indian time, arrived at less appropriate times in more westerly time zones.

What is most interesting here are the answers to our question about responses to inappropriate messages. While 33% of *active users* said nothing happened or they didn't know what happened, the remainder of the respondents cited a variety of responses, including seeing people: "vote 'not appropriate' in a poll" (68%), broadcast replies to the community telling the sender not to continue (48%), and join a FreeJam and tell the sender not to continue (29%). Indeed, one community owner wrote, rather tellingly, that: "*More and more I like to do my homework first so I don't have a hundred people yelling at me that it's right here in the documentation you idiot*" (I11).

GENERAL DISCUSION: ICT'S BENEFITS AND COSTS

Aside from the basic value of answering questions, ICT users valued its immediacy. While speed is desirable whenever an answer is needed, several interviewees commented on the usefulness of ICT in customer facing situations. As one owner said, "*People on help desks use ICT. They are on the phone with a customer and they don't have time to Google an answer. They need an answer right now.*" (I4). Furthermore, when working with a client, there

is considerable cachet to being able to instantly and visibly tap a global community for an answer: it is a compelling demonstration of the power of a large organization. Not only is the speed of obtaining an answer useful, but so is the fact that answers are obtained via chat. Chat enables users to interact synchronously so that – as has also been observed for Zephyr [1] and ReachOut [10] – they can better understand the question, obtain more detail about the problem context, and build upon one another's responses.

In addition to its immediacy, another valued aspect of ICT is its breadth of reach. The global span of ICT communities means that people are available during 'non-business' hours. One interviewee commented that he didn't worry about when to broadcast a question: "*If I post it at 9am, I hope that someone in Europe will answer it, and if it's 5pm, I hope that someone in California will answer me.*" (I6). ICT communities also have breadth of reach in the sense that most community members are strangers to one another. This is significant because, as social network theorists have observed, we get more valuable information from those to whom we are weakly connected than those we know well [7]. ICT, as it exists in IBM, is an extreme case of a mechanism that supports weak-tie (or perhaps no-tie) communication, and is thus well suited to Q&A.

Finally, users valued the ability of ICT to enable them to form connections with others. As noted earlier, nearly half of the active users reported that an initial encounter in a FreeJam or SkillTap had lead to other interactions outside of ICT broadcasts, ranging from finding an expert to directly interrogate, to forming friendships that lead to face-to-face contacts and social interaction. This is a bit surprising given the fact that FreeJams are generally very short (lasting about 10 minutes) and small (about 9 people), and the fact that, on the individual level, the amount of activity is not very high. Perhaps, the relative intimacy of ICT's chat promotes the formation of connections; it would be interesting to compare tie formation between synchronous broadcast messaging applications, and asynchronous broadcasting applications such as email distribution lists and newsgroups.

Although ICT's benefits are not without their costs, we found the costs to be less than expected. Disruption due to the random arrival of broadcasts with their 'dings' and sliding windows was not normally experienced as a significant problem. Most of the users we studied reported using ICT's built-in mechanisms for controlling the number of broadcasts they received, and also reported that ICT was easy to ignore if they were doing something else. However, a limitation to this finding is that we only studied active users of ICT; the possibility that more interruption-sensitive users abandoned ICT deserves more investigation.

Similarly, inappropriate use was not considered a significant problem by most. As in Zephyr, users engaged in various forms of self-policing. Some of these involved using mechanisms built into ICT for the purpose. For

example, every Instant Poll automatically includes the response "This poll is inappropriate." More generally, since all ICT broadcasts include the sender's ID, it is easy to send an instant message, or even access the corporate directory and contact the sender's manager (both behaviors were reported in our interviews). Finally, users find their own ways to discourage misuse, ranging from Instant Polls that ask "Who is tired of this?" to direct rebukes in FreeJams.

Besides the costs of deviant behavior, and the costs of policing it, there are the costs of engaging in the normal use of ICT. However, these are not great. As many of our interview subjects noted, responding to a broadcast is neither taxing nor obligatory: "*It takes a maximum of a minute, maybe. I think it's a value to me to help another IBM'er. It's a personal choice, so if you don't want to answer, you shouldn't feel bad.*" (I4). Furthermore, compared to the amount of activity in one-to-one communication via email or IM, the level of activity on ICT seems rather low. Most users belong to only a few communities, and thus see just a few broadcasts a day. This level of activity is similar to that of other group chat systems: ReachOut had an average of 4 to 5 discussions a day across all 200 users in one deployment [10], and even fewer in the other deployment [18]; in the case of Rear View Mirror [8], the most active of its work groups averaged about 10 messages per day.

A potential cost of ICT is that those who display expertise on it may risk being inundated with requests for assistance. However, while our interviews identified a couple of instances in which ICT enabled a user to form a connection with an expert, no one identified this as a problem. On the other hand, this was not an explicit question in our interview protocol, nor was it addressed in the survey, and so it clearly deserves further investigation. We speculate, however, that what happens in ICT is not so much about locating an "expert", but rather about locating someone who has had a particular experience. As one interviewee said, "*It's amazing what… everybody picks up different little tricks and ways of doing things. And so even someone who is not a Java guru, who doesn't spend all day programming Java, can really contribute a lot.*" (I11). If this is generally true, the concern that experts may be inundated by requests for help may be overstated.

CONCLUDING REMARKS
We began this paper by describing the experience of using ICT, remarking on how we were surprised by its popularity, and wondering how and for what purposes it was used. Our study indicates that ICT is used primarily for asking and answering work related questions, and that it is valued for its immediacy, breadth of reach, and its ability to connect coworkers around the world. We saw fewer costs of use than expected, due to the use of mechanisms for managing message receiving and the self-policing of norms.

ICT, Zephyr and Synchronous Broadcast Messaging
It is particularly interesting to note the similarities between ICT and Zephyr in light of their rather different user populations and organizational contexts. Both are used for Q&A. Both are immediate: if a question does not receive a response within seconds, it is unlikely to receive one at all. Both are ephemeral: once an interaction is concluded, its users can not return to it, nor can others access a trace of it. Finally, both have norms about not abusing the system (e.g., seek answers elsewhere before asking), and in both cases those norms are maintained by self-policing.

We claim that ICT, Zephyr and ReachOut are all examples of a relatively unstudied genre of CMC: synchronous broadcast messaging. Synchronous broadcast messaging applications are characterized by broadcasts to large populations, comprised mostly of mutual strangers, which draw participants into a synchronous form of interaction. The synchrony of interaction, in turn, enables participants – who may share little common ground – to jointly unpack questions and construct answers. It also provides an effective channel for exercising social control.

Community Amongst Strangers?
One of the most interesting characteristics of ICT is that much of the communication appears to occur amongst strangers. This is interesting because, on the face of it, it seems to work *against* many of the social phenomena that we've observed. The norm that one seeks answers elsewhere first, the altruistic motivations for answering questions, and the fact that inappropriate use is manageable by social pressure – all of these phenomena should be weakened by the fact that most participants do not know one another.

Perhaps the answer lies in the fact that participants belong to the same organization. The identification of participants, and the concomitant possibility of invoking organizationally sanctioned discipline, may balance the paucity of ties amongst participants. More positively, users of ICT recognize that they are all part of the same organization, and operate under similar pressures. As one interviewee put it, "*I think the folks who subscribe to the same communities I do know that everyone is busy, and they only use these channels when they really need assistance*" (I3). It may be that synchronous broadcast messaging works best within organizations, where both the individual's identity and their relationships to others are organizationally constructed.

This rather paradoxical combination of communication amongst strangers that furthers work and supports the creation of relationships brings to mind the work of the political scientist Benedict Anderson. In 1991, Anderson published *Imagined Communities* [2], in which he explored the rise of nationalism and asked how it was that the modern nation state was able to evoke such feelings of loyalty that it was able to marshal hundreds of thousands to die for its causes. His answer has to do with the notion that

community can be imagined, and that most communities beyond the size of villages are, in fact, imagined; the larger the group is, the fewer people who directly know or even recognize one another. He credits the institution of the daily newspaper with creating the conditions for the rise of nationalism: a now-famous image depicts the reading of the morning paper as a mass ceremony that a participant, while sitting alone at the breakfast table, imagines "being replicated simultaneously by thousands (or millions) of others of whose existence he is confident, yet of whose identity he has not the slightest notion."

While a global organization may not inspire the same loyalty as a nation state, it is interesting to speculate on the parallels. Perhaps, just as the daily reading of the paper reinforces imagined connections and loyalties within nations, so too does the circulation of digital messages act upon the large organization. To the extent that this is true, the daily presence of over 13,000 IBM employees on ICT – most of whom do nothing as the messages roll by – becomes a bit more understandable. The soft dings of broadcasts, whether evoked by technical questions sent to *Java Programming* or the occasional bursts of banter from India, serve as tangible reminders that ICT users are part of IBM's global web of simultaneous activity.

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