MyUnity: Building Awareness and Fostering Community in the Workplace

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ABSTRACT
Successful collaboration depends on effective communication. Ongoing group awareness facilitates communication by enabling workers to be more informed about their collaborators, about their activities, and about the interpersonal dependencies among people working together. In this paper we present MyUnity, a new system that aids workers in building group awareness. The system uses multiple sources, both automatic and user-provided, to report colleagues' location, availability, current tasks, and preferred communication channels. Information is aggregated, fused and presented as a simple presence state for each worker. Workers can each independently control what information is collected by the system, allowing them to participate in the system without compromising their privacy. Results from a four-week field study show MyUnity increased group awareness and fostered an increased sense of community in the workplace. Results provide insights into the utility of awareness systems in the workplace.

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group awareness, workplace studies, communication

INTRODUCTION
Effective communication among workers is the backbone of any successful organization. It is essential for enabling people to build common ground, to create and develop new ideas, and to develop the complex interpersonal relationships that are critical in helping workers share and combine expertise [11,17,21]. An important building block of effective communication is ongoing group awareness, including knowledge of co-workers and their current status, current projects, and how individual actions may affect others [12]. Building group awareness has become increasingly difficult in today's modern workplaces. Workers have more flexible schedules, often working outside the traditional 9-6 workday. Work is sometimes performed in remote locations, such as from home, at client sites, or in public venues like cafes or libraries. These and other barriers have been shown to negatively affect the quality of workplace communication. Adding to their communication overhead, workers have increased their use of specialized tools, such as instant messaging and social networks, to communicate with peers. For instance, one workplace study found that nearly 20% of workers' time was spent coordinating communication [20]. Even simple things, such as determining if someone is in their office and available to engage in a communication, can be difficult and time consuming.

Furthermore, studies have linked the need for group awareness to critical workplace functions. Ichniowski, et al. [16] found that Connective Capital, the ability to take stock and leverage expertise of colleagues, was influenced by how aware workers were of their colleagues and their activities. Straub and Karahanna [25] found that workers would consider a colleague's social presence over the context of task when choosing a communication medium.

To assist workers in building and maintaining group awareness, we created a new system called MyUnity. Designed specifically for small to mid-sized organizations or workgroups, MyUnity enables immediate access to key information needed to build group awareness. Gathered from multiple sources, both automatic and user-supplied, this information can include workers' physical location, current task, availability, and preferred communication channels.

The features and functionality of MyUnity were developed and grounded in both our own research into workplace awareness needs and in lessons from past work. A key aspect of MyUnity's design is that it allows workers to choose the information that is reported about them. In this way people can participate as users of the system without compromising their privacy or data-sharing concerns.

A four-week field study in a corporate workplace found that MyUnity had an overall effect of increasing group awareness and fostered an increased sense of community among study participants. Our results provide insight into the utility of awareness systems in the workplace.

RELATED WORK
In this section, we review existing tools and systems that seek to provide awareness in the workplace, describe past studies of awareness tools, and discuss the broader field of
research related to the study of awareness needs in office environments.

**Systems for Fostering Awareness**

Several commercial and research systems provide single-channel awareness to co-workers. For example, shared calendars can be used to allow workers to be aware of the scheduled activities of others. Chat and instant messaging software often relay whether or not a set of designated contacts are currently using their computers. Tracking systems that use ultrasonic, active RFID, or other RF technologies (e.g., [29]) can be used to determine a worker’s location in the building. Portholes [7] allowed a worker to observe the state and activity of a co-worker via a switched, closed-circuit video feed.

While all of these systems provide some level of group awareness, the narrow, single channel of information that they supply often falls short of providing an adequate level of awareness to facilitate many common workplace communications. As such, people are left to combine information from these sources on their own, often unreliably and with high time and effort costs.

Sideshow [4] and Community Bar [19] collected some awareness information, such as IM status and calendar, into a side bar interface. While these systems did bring together information from multiple sources, they did not perform any higher level filtering or summarization of presence state; e.g., merging status information provided by the IM and the calendar.

Social networking tools are also being used to promote awareness in the workplace. For instance, Beehive [6] provides a central interface for contact information, work assignments and past projects that is integrated with more personal information, such as photos and short status messages. Jammer [30] is a Twitter-like [31] tool for corporate environments that allows workers to post short, work-related messages. While each of these systems provides awareness information, their overall effectiveness is dependent on high participation, as the posts can quickly become dated if users do not update regularly.

**Studies of Awareness Systems**

Past work has shown the value of context-enhanced communication tools. For instance, Hsieh, et al. [13] studied a context-enhanced IM client and showed that the added context about a person’s location and a statistical model of interruptability were both appropriate and useful in negotiating communications. Similarly, evaluations of sensor-based models of interruptability (e.g., [1, 9]) have shown that certain environmental cues are more meaningful than others for deducing the activity of other people. Our work builds from the results of these studies by helping to inform the selection of our sensor aggregators and the type of information they report.

Studies of systems that support group awareness have been performed, but the research is fairly limited. Romero, et al. [23] studied the use of an awareness tool in university settings and found that many of the theoretical design assumptions made in Community Bar were incorrect. For instance, implicit actions were made explicit, often by too much, in the system’s visual representation of state. Szorstek, et al.’s recent study [26], also situated in a university setting, finds that simply visualizing availability is not enough; awareness tools also need to be reciprocal, and users need to be accountable for the information represented in the system.

Our work both builds from and extends these past studies. Lessons learned from each study were incorporated into the design of MyUnity. For example, Szorstek, et al.’s [26] recommendation of accountability directly affects how MyUnity negotiates uncertainty. An important difference between our study and previous work is that our study examines the use of awareness tools in a business environment with respect to understanding how they affect workplace communication. Results from our study have implications for the design of future awareness tools for similar environments.

**Awareness in the Workplace**

In studying how workers collaboratively write papers, Dourish and Bellotti found that maintaining an understanding of others’ activities as it related to the group task was a fundamental necessity for effective coordination [8]. Begole, et al. [2] and Reddy and Dourish [22] observed that workers exhibit periodic, predictable behaviors, or rhythms, which are often perceived by colleagues and may support decisions on how or when to establish contact. Deviations from the rhythm can alert colleagues to potential problems or need for oversight.

Our work builds on these studies, providing a system that enables workers to quickly understand ongoing group activities and workplace rhythm. Our field study suggests that our system does indeed improve workers’ overall awareness and connectedness to colleagues.

Recent work has investigated privacy concerns related to the use of context-sharing systems. Lederer, et al. [18] found that the specifics of the situation and with whom the information would be shared greatly affect a user’s decision on what information to share. Brush, et al. [3] specifically focused on users’ concerns related to where information was presented. While they found no large effect of presentation location, they did find differences among users with respect to what information they would allow to be reported by an awareness system. Our work addresses selective reporting by providing users with direct control over what information is reported and when.

**UNDERSTANDING AWARENESS NEEDS**

Following a User Centered Design process, we began with surveys of knowledge workers to better understand their awareness needs.

**Motivation and Methodology**

Building off the work of existing research (e.g., [3,8,18,23,26]), we sought to better understand the types of information that knowledge workers need to support their day-to-day communications, how that information is acquired and assembled, and how variable these practices are across workers.

We conducted a survey in a small research lab of about 50 employees in the United States. 19 employees responded to
our survey. Professions consisted of researchers, software programmers, IT support, administration, and executive staff. Covering all these roles allowed us to build a comprehensive understanding of an entire organization’s awareness needs.

The target population exhibits many of the organizational qualities of small-to-mid-sized businesses (less than 100 employees), which comprise nearly 85% of companies in the U.S. [28]. For instance, all workers are co-located in the same building, have different backgrounds and expertise, are organized into project groups/divisions, and tend to work on individual, but highly interdependent tasks. We argue, therefore, that our results may generalize to other small- to mid-sized white-collar organizations.

Our survey, comprised of 52 questions, was electronically distributed on the corporate intranet. The survey inquired about information the workers use to gain awareness, what tools and methods they use to collect this information, and how often they go about collecting this information (i.e., building awareness). The survey also inquired about what information the workers were willing to provide about themselves and about their actions, as well as what types of controls workers would require on the use of this information.

Results
Analysis of the survey results revealed the following:

- **Awareness information greatly informs selection of communication medium.** Specifically, knowledge of physical location and current task are often used to determine the method of communication. Moreover, when adequate awareness information was not available, communications were more likely to break down.

- **Even in a relatively small organization, workers feel their awareness of their colleagues is insufficient.** Other than immediately co-located colleagues, workers reported they have a poor understanding of their colleagues’ presence state, current task, and perceived availability. Feelings of disconnection were most prominent when a worker was working remotely (e.g., from home).

- **Willingness to provide awareness information to colleagues varies widely across workers.** Similar to the findings of [3], there was a wide spectrum of information that workers are willing to share — ranging from no information at all to nearly a moment-by-moment account of presence and activity.

- **Existing methods and tools for building awareness are piecemeal and unreliable.** Workers reported using several different information sources for building awareness, including corporate calendars, IM presence, email histories, and social networks, which were often used collectively. Workers also reported that these existing information sources were unreliable, e.g., IM tools that incorrectly reported presence state.

Design Implications
Based on the results of our survey combined with previous work, we concluded that workers would benefit from better tools that allow them to build and maintain awareness of colleagues. We designed MyUnity to provide comprehensive presence information, lightweight task information, and loose integration with existing computer-based communication tools, while satisfying user privacy preferences. Our choice of awareness information was driven by two information needs for creating awareness: 1) where can I find my colleagues? and 2) what are the ongoing activities in the office? These correspond to specific awareness needs of particular coworkers and to a general awareness need for a sense of activity at work.

We opted to use multiple channels of information, for example, collecting information about both computer activity and office activity, so that users could choose their level of opt-in to the system. Since different people have different privacy concerns, we support multi-level opt-in, which enables the system to provide useful information for users with differing privacy concerns.

**MYUNITY**
MyUnity consists of three main components: a front-end awareness dashboard, a bank of sensor and external data aggregators, and a central server. Each are discussed in turn.

**Awareness Dashboard**
The awareness dashboard was designed to meet the needs for both general and specific awareness and contains several channels of awareness information important to workers. Shown in Figure 1, the default view of the dashboard consists of two components: a photo tile summary of the workers represented in the system (top) and a scrollable display of textual status messages from the workers (bottom).

**Photo Tiles**
The photo tiles summary area communicates both general and specific awareness. It contains a photo tile for each worker in the system, consisting of the first name (or nickname) of the worker, their self-selected photo, and a border. The border’s color reflects the worker’s current presence state. Three main colors are used. A green border indicates the worker is physically at the place of work (e.g., office building). Blue indicates the worker is connected remotely. Purple indicates the worker is in their office with one or more visitors.

The saturation (intensity) of the color conveys a lightweight measure of availability. For instance, if sensor information indicates a worker is in his office, the border will appear dark green, but if sensor information indicates he is in the building but not in his office, then the border is lighter green. Similarly, a remote worker who is actively using his computer will have a rich blue border; it will turn to a lighter blue when he is away from the computer.

In addition to the colored border, icon overlays are used to reinforce the presence state or provide additional information. For instance, a silhouette icon appears on workers with visitors, and a calendar icon appears on workers who have scheduled events on their calendar for the current time. As we show in our study of the system, this visual representation aids workers in selecting a communication channel (e.g., face-to-face vs. email) and the likely success of establishing communication on that channel.
Clicking on a particular photo tile provides additional information about the worker. Similar in organization to a business card, this detailed view (illustrated in Figure 2) provides details on the worker’s presence information, current status message, and links to IM and email. Clicking on the email link launches an email addressed to the worker. Clicking on an icon linked to an IM client initiates a new IM communication using the particular tool. Only tools/channels activated by the recipient can be selected. In addition, the business card shows an approximate location for workers who allow MyUnity to show location information.

**Status Messages Feed**

While the photo tiles provide awareness about a worker’s presence, the automatically collected information provides poor awareness about the person’s current activity or task. While there are several research systems that try to infer a person’s current activity (e.g., [5,10,15]), the results provided are often inaccurate or not detailed enough. Further, as we found from our study of awareness needs, workers want to have direct control on how their current activities are reported, as not all activities need or should be shared.

Rather than guessing, MyUnity allows workers to quickly post short text messages describing their current activity.

**Sensor and External Data Aggregators**

Information presented in the awareness dashboard is collected from a bank of independent sensor and external data aggregators. The MyUnity aggregator architecture is component-based, allowing new channels of awareness information to be added, updated, or removed at any time.

Five aggregators are currently available in MyUnity. These aggregators were implemented because they provide the core awareness information recommended by our initial research and past work:

- **Vision-based office activity.** Using a video feed from a small wide-angle camera (mounted in the corner of personal offices), workers can specify the physical space of their office that they typically occupy as well as space that is occupied by visitors. When motion is detected in these regions, an appropriate state is reported.

- **Cell-phone/personal device presence.** Bluetooth access points installed throughout the physical space can be used to locate a worker’s cell-phone or other bluetooth-enabled mobile device. These allow the system to know if the worker is physically in the building and the approximate location. Compared to other tracking techniques (e.g., [29]), this method does not require specific equipment or actions by workers and allows them to easily toggle their tracking state (e.g., by turning off bluetooth or leaving the device behind).

- **Computer and network location software client.** Installed on each worker’s PC, the client reports when the worker is actively using the computer (by detecting mouse and keyboard activity) and the network address they are connecting from inside the corporate network or remotely on VPN.

- **Calendar.** Information from various calendaring systems can be linked to the worker’s MyUnity profile. These include information from corporate calendars (e.g., vaca-
Several systems seek to provide an understanding of a person’s interruptability. The toolkit by Fogarty and Hudson [10] used computer activity, ambient sound, and other sensors, processed with machine learning algorithms to predict a person’s interruptability. Other systems (e.g., [5, 15]), performed similar functions with different configurations of sensors. In contrast, MyUnity does not seek to infer a person’s level of interruptability. The system makes available several useful information channels, which are summarized into an easily understandable presence state, enabling the user to form a multi-faceted awareness to make their own informed decision about the interruptability of peers.

Several toolkits provide context support for building applications. The Context Toolkit [24] and others [14] provide an architecture allowing programmers to quickly build awareness tools from multiple independent sensor and external data components. While similar, there are two main differences between them and the work presented in this paper. First, the goal of these toolkits is to provide generic application-level support for context, not drive a particular application. A second difference, following from the first, is that there are significant design differences in how sensor data are controlled and relayed to end-users. For instance, the Context Toolkit [24] enforces client privacy policies by restricting access to already collected data, while MyUnity controls privacy by directly managing data collection at the source (i.e., the sensor).

FIELD STUDY
We conducted a four-week field study of the system. We chose a field-based approach over a controlled lab study for several reasons. First, we wanted to understand how workers used MyUnity to fulfill their own awareness needs rather than those contrived in a lab task. Second, studying in situ allowed for the best understanding of how communication practices were affected by the system. Third, use over an extended period of time enabled workers to more meaningfully articulate their own perceptions of value and utility.

Subjects
We solicited employees from our organization to participate in the field deployment. The first 20 employees who responded to our solicitation were included in the study. Participant occupations were widely distributed and included 8 research scientists, 4 software developers, 3 administrative/support staff, 3 executives, 1 human resources staff, and 1 multimedia specialist. In addition to the three executives, four participants had management responsibilities and supervised subordinates. All workers had offices located on the same floor of an office building — a typical configuration for an organization of this size.

Data collection
Before, during, and after the deployment, we collected several different kinds of data. The data collection included:

- Initial interview: Each participant was asked about their current communication practices and awareness needs, the methods and tools they used, how awareness is used

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in their day-to-day communications, how and why breakdowns occur, and desired features for a tool that fostered workplace awareness. Each interview lasted approximately one hour.

- **Communication Diaries.** The communication diaries were designed to document the participants’ communication channels, who they communicated with and how many communication acts they had during a day. Diaries were filled out by each participant for the one-week period before MyUnity was introduced to establish a baseline and for the last 1.5 weeks of the three-week deployment. During the data collection periods, short five- to fifteen-minute interviews were conducted.

- **SART.** We administered a modified version Taylor’s situation awareness rating test (SART) [27] at the beginning and end of the study to gauge how MyUnity affected participant’s subjective awareness.

- **Logged Activity in System.** We logged several interactions with the system, including when the dashboard was open, when aggregator preferences were changed, and when status messages were posted.

- **Final Interview.** Participants were asked about their use of MyUnity. Each interview took approximately a half hour.

## RESULTS

### Communication

The communication diaries produced 6123 communication acts from 19 participants. We removed one participant, since he was traveling during the later part of the MyUnity deployment period and hence did not keep a communication diary during that period. We also removed the communication acts that took place during work when participants were out of the workplace. While MyUnity is designed to enhance awareness not only in the office but also when remote, the out-of-office data were sparse, comprising only 297 communication acts (4.8%).

To compare the communication acts before and after MyUnity deployment, we removed communications methods with fewer than 40 total acts. The remaining communications methods — face-to-face, email received, email sent, text chat (IM), and phone — totaled 5826.

There was no overall difference in the number of communication acts per day between the pre-MyUnity week and the third week of the MyUnity deployment ($F(1, 18) = 0.019, ns.$). There was an interaction between the two diary periods and the communication channels ($F(4, 72) = 4.63, p < .01$). That is, although the overall amount of communication acts per day was about the same, people shifted communication channels after the MyUnity deployment. Face-to-face communications per day increased from an average of 9.2 to 10.8 and the amount of received email decreased from 11.2 to 8.8. The number of communication partners per communication act did not differ before and after MyUnity deployment ($F(1, 18) = 0.508, ns.$). Although these are early results from a short time period of deployment, they are encouraging, as they show an increase in face-to-face communication.

Self-reported use of MyUnity collected during the final interview was significantly correlated with the reported number of communication acts per day ($r = .80, t(17) = 2.70, p < .05$). The more communication acts people have, the more MyUnity and its features are used to create awareness of their colleagues. These results suggest that the value of MyUnity increases with the amount of communication performed by the worker.

### Situation Awareness

We modified the original SART questionnaire to better fit within the context of communication initiation. Six questions covered the situation awareness dimensions of attentional demand, attentional supply and understanding of situation as described in [8]. We constructed five scenarios and a training scenario and asked the study participants to place themselves in the scenario and answer the questions accordingly. From the six questions, we constructed a measure of situation awareness (SA-score) using standard SART procedure, i.e., mean of understanding minus mean of demand plus mean supply.

Results show that the participants’ awareness had increased significantly from pre- to post-deployment of MyUnity ($F(1, 19) = 5.685, p < .05$). On average the participant’s SA score before deployment was 53.1 (SD=30.53), and after deployment 60.7 (SD=32.56). In general, this result matches with participants’ perception of awareness change after MyUnity was deployed. Fourteen out of nineteen participants indicated their awareness of their co-workers had improved with MyUnity. Given that the system was only deployed for three weeks, these results are encouraging.

Although during its three weeks of deployment, MyUnity did not affect the number of communication acts or the number of partners, the awareness of potential communication partners rose, as shown both by the rise in SA-scores and the user reports. With increased awareness, the initiation of communication can be more successful. When people can tell if their intended communication partner is in his office or not, with a visitor or not, they have more information to guide them in their decision on when and how to initiate a communication. This conclusion was also supported by the interviews from MyUnity users (see below).

### Using MyUnity

Analysis of the communication diaries found that people reported using MyUnity on average 2.9 times per day (SD=2.50) without having a particular person in mind. Our participants also reported that they used MyUnity an average of 3.4 times per day (SD=3.15) to check the status of a particular person. These results show regular use of MyUnity to gain both general and specific awareness.

We also logged when they opened and closed the dashboard. Although the logging was not complete (some open and close events were missed), it still gives an indication of how MyUnity was used. On average, MyUnity was open for 162 hours per user (SD=197.1) during the three weeks of deployment, or around 7 hours per day per participant. The variance between participants was large. Some had the MyUnity dashboard open all the time, while others only opened it when they felt the need to consult it. Users opened
the dashboard on average 23.3 times (SD=24.42) during the deployment period. Four users opened it ten times or less, while five users opened MyUnity 30 times or more. One of these opened it over 100 times.

Participants enjoyed having MyUnity. All but one wanted to continue using the system after the deployment period. The majority of people (17 of 20) thought the biggest strength of MyUnity was its ability to create an awareness of co-workers through status and location information.

**Status Messages**

Analysis of status messages included both their creation and clearing. Participants set a non-blank status message a total of 137 times, an average of 1.7 status messages per participant per week of the deployment period. Seventeen participants set at least one status message. Seven set more than 10 status messages each. The average status message was visible for 33.48 hours (SD=3278.5 min). During the first week of deployment, a total of 58 status messages were set, which accounted for 42% of all status messages. After the first week the number of status messages leveled off to between 23 and 29 per week. In an additional 49 instances, participants cleared their status rather than putting up something new. Blank messages on average were on display longer than non-blank messages, for 49.02 hours (SD=5441.7 min, not a statistically significant difference). Our user pool is small, and for status messages to gain traction it is likely that a larger pool of users would give a greater sense of activity in the status feed.

Status messages were coded into seven groups: reporting location, reporting activity, reporting time constraints, directed comment or question, undirected comment or question, directed greeting, undirected greeting and MyUnity comments or questions (i.e., questions about MyUnity features or bug reports). Messages could belong to more than one group.

The main use of the status messages was to report on activity (33 messages), followed by undirected question or comment (30 messages). The undirected questions or comments were often social in character; comments on direct work-related activity were coded as reporting activity. At times the undirected comments generated some short exchanges between MyUnity users. Interestingly, the number of blank messages rose over the weeks, indicating that users may have become more familiar with the status messages and noticed a need to update or clear messages.

**Findings from Interviews**

MyUnity is intended to provide both general and specific awareness of its population to its users. In our interviews with participants, we sought to understand whether they gained a sense of awareness, and if so, what aspects of MyUnity they used contributed to it. In addition, the interviews provided a picture of how people used the information provided by MyUnity to aid in their communication with others. All names have been replaced to protect the privacy of our participants.

**General Awareness**

General awareness entails having a sense of who is around and perhaps what they are currently working on. A general sense of awareness could be obtained by examining the pattern of border colors on the dashboard, noting calendar icons on a photo tile, or reading status messages in the scrollable window. It could also include a casual examination of the presence state or bluetooth reading on the business cards of one or more persons without the intent to contact them. Nearly all participants (90%) reported obtaining some degree of general awareness from MyUnity. Most (75%) reported using it to get “a sense of who was around.” Some made it a standard part of their day’s activities. “I look at [MyUnity] at the beginning of the day to see what’s up and to see who’s around,” said Alex. Others mentioned glancing at it now and then to keep up with “the ebb and flow” of the office. People used it to “be aware of where people are,” “get the office’s availability,” “out of curiosity,” “just socially,” or “just for fun.”

The pattern of presence colors at times offered additional information. Isaac related noticing that “people disappeared from their offices. Did I miss a talk?” Colin, whose daily schedule generally is to arrive early and leave early, commented that “when I get home [and log in from there], it’s kind of cool, people are still at the office.” Nate checked MyUnity one day “to see how many calendar dates there were, because the office felt extremely dead,” and found his suspicion was confirmed, that many people had taken vacation on that day.

Participants also read the status messages to get a feeling for what was going on in the office (67%). “I read the status messages,” commented Kyle, “usually after a break time, like after lunch when I got back, to see what’s going on.” The brief messages allow participants to “keep up with people” and provide a social connection “analogous to passing in the hallway.” Several participants used the status message to indicate their availability, such as “In late to stay late” or “I’m signing off for now ... to read a document.” One problem noted by several people is that such messages often become out of date, without getting replaced by a more current one or cleared entirely. The time stamp on status messages was helpful in assessing their relevance.

The border colors to indicate a person’s presence state received mixed reviews. The green shades signifying that someone is in their office or in the building and the purple border with the visitor icon were helpful and immediately understood. Colors indicating remote login, out of office or off-line were often confusing to people. Some participants commented that they monitored their own status to check to see if it was accurate and generally found that it was.

The calendar information was considered useful by many. Although the information from the corporate calendar was available elsewhere, it was considered far more accessible in the dashboard. Of particular use were scheduled out-of-office calendar events, such as working from home, on vacation, at a conference, or taking a sick day.
Specific Awareness

When someone would like to communicate with another colleague, specific awareness provides contextual information relevant to the initiation of that act. A person often considers the state of the other person: Is the person in the office, working from another location, or on vacation? Is the colleague talking to someone else, in a meeting, or not wanting interruptions? A specific sense of awareness involves the examination of the available information on a particular person. In MyUnity, this includes the presence state and border color, calendar items, current status message on the business card, the bluetooth reading if available, and the available IM clients. For example, in describing how he would use MyUnity to decide how to communicate, Marco said, “If here or not [color, presence state], I would do face-to-face, otherwise email. Isaac is on the computer from home [color blue], so I would send email. Danielle is in Yosemite [status message], so there’s not much point in sending email.” So while general awareness provides an overall sense of the people in the office, specific awareness is focused on a particular target.

Most (85%) participants recounted at least one instance in which they used MyUnity to check the status of someone before initiating a communication. The most common type of information people sought was the location of the communication partner. Generally, it is not difficult to go to someone’s office if a face-to-face conversation is desirable. However, people also didn’t want to expend potentially wasted effort if the co-worker was not in his office. A number of people said that they checked a person’s color before going to talk. “Sometimes it saves me a walk to the other side of the building. Not that I mind walking there. But I check if the color is right before I go,” observed Marco. Kyle reported that a person who didn’t have MyUnity asked him to check on the status of a third person. Helene needed to talk to Marco, who she knew was in a meeting. She waited until MyUnity indicated he was back in his office to go there. Sometimes, if the matter was urgent and the person was not in his or her office, participants found them through their bluetooth status.

Participants also used presence status to determine what the communication partner is engaged in. If a person is alone in their office, they tend to be considered more available for a conversation. Julia said she would not go to someone’s office if they were unavailable, and she used MyUnity to assess that. This is not to say that people disregard in-person contextual cues, only that the information from MyUnity is used to make the initial decision on whether to talk to someone in person at a particular time.

Gordon, one of two participants who did not get a sense of general awareness from MyUnity, wanted information to be “user generated, not automatically generated for me,” so that “people could freely say if I’m offline or if I’m here.” Earl, the other person who did not find that MyUnity fit his purposes, described it as “voyeuristic,” although he complains that the bluetooth resolution is insufficient to be useful. “It says ‘near [the conference room]’. You want to know are they in [the conference room]? are they in the kitchen?”

Participants who did not use MyUnity for specific awareness did not see a need to know more before initiating a conversation. Zeke explained it this way: “When I want to see someone, I go there. If I want to call, I just call. If I want to email, I email.”

Although most participants who used the system enabled all available information sources, a handful did not. Four people did not allow a camera in their offices; three of those plus one other did not use bluetooth. Thus, the information available about these people was more limited. Some people learned to use this, as Marco did: “Because Helene doesn’t have a camera; I can’t tell if she is in unless she is using her computer; so I wouldn’t go there unless she was using it.” Others were frustrated because they couldn’t get any information about someone they needed to talk to, as was the case when Nate tried to find Gordon. “He wasn’t in his office. Where is he? Nothing on MyUnity, no VPN, no bluetooth, no calendar events... Most people, I can figure out where they are, that is, in office, in the building, or not.”

During the study, twenty-six people used MyUnity, which was a substantial portion, although not all, of the organization’s population. Thus, inevitably, people wanted to talk to others who were not using MyUnity. Nearly everyone in the study had at least one major communication partner, defined as one of the top four people with whom a participant communicates, who was not using MyUnity. A few participants, mostly those with more than one missing major communication partner, noted that there were “missing users.” Some expressed a desire to have everyone use it.

Awareness Mediates Communication Choice

As a small company in close proximity, the predominant and most preferred method of communication is face-to-face, followed by email, with instant messaging and telephone considerably less frequent. People generally have very specific reasons for choosing one method of communicating over another. We hypothesized that the information provided by MyUnity would help determine an appropriate method of communication in some cases. That is not to say that we expect people will always consult a person’s status before making the choice of method. But we believe that people would use it to help coordinate communication and that it would play a part in some communication acts where more than one method would be appropriate.

We found that about two-thirds of the participants were using MyUnity to mediate their choice of communication method. The most common instance of this was looking to see if a person was in their office before initiating a communication. If the person was there and alone, the participant would walk over to talk in person. If a visitor was in the office, the participant considered the nature of the communication and how important it was that it be face-to-face. Shari describes an example of this:

With MyUnity, I check to see if a person I need to talk to is in their office. If they are I just walk over. Once I saw that the person had a shadow [visitor icon], so I sent an email instead. MyUnity helps me decide how to communicate.

If the communication needs to be face-to-face, a person may coordinate that through email or by keeping an eye on the
person in MyUnity until they are free. Richard needed to talk to Fiona about a complex topic. Using MyUnity, he found that she was working at home, so he “decided to send email to schedule a face-to-face the next day.” Nate used MyUnity to determine when Walter was in his office so they could discuss the results of a test. After finding Walter about to go to a meeting, he returned to his office, checking MyUnity several times over the next several hours.

The next time I checked, he was back to his office, so I walked over and we had the discussion. Usually, I would have sent an email ‘Can we have a chat?’ It is less poking on the other person to check MyUnity first.

People used MyUnity to decide to switch from email to face-to-face communication. Isaac choose to walk to Walter’s office instead of responding to his email, because he “knew Walter was in his office via MyUnity status.” Often, if a person was not in their office, people chose to send an email rather than wait. One person also monitored people’s status when he sent an email. If they were in their office, and did not respond quickly enough, he walked over rather than waiting for the person to respond.

**Sense of Community**

The awareness of your colleagues helps to foster a sense of community. People in the company we studied have private offices. Once a week, there is an all-hands status meeting. The rest of the time, people are alone in their offices or in small groups. Interactions tend to be with a small group of people around project-related work. Even in the short period of time we observed our participants, several commented on an increased sense of community as a result of their use of MyUnity. Colin summed it up this way: “I know they are here, and that’s nice.... It’s done a lot for my sense of community.” Julia thought it “promotes the feeling of having people near your office.” In commenting about the use of status messages, Fiona said, “I don’t know about the usefulness, but it feels relevant. It is nice to have. And it gives a sense of community.”

**DISCUSSION**

To understand the contribution of MyUnity more broadly, we discuss the implications of our study for further work.

**Improved sense of awareness.** Overall, MyUnity was successful in increasing workers’ awareness of colleagues. This was evidenced through both measurements of situation awareness as well as direct participant feedback. Moreover, feedback from participants found that increased awareness promoted a sense of community and connectedness with the activities of colleagues. Moving beyond the limits of our four-week study, we will seek to understand if the effect is persistent and/or evolves over time.

**More effective and comprehensive awareness information.** While all features of MyUnity were not seen as equal, no one feature of MyUnity stood out as the strongest or most useful in our study. We found that a combination of features was often used to inform a user’s specific awareness need. Users also reported less dependence on existing tools like IM and public calendars for building awareness. Such results are promising as it suggests that in many cases MyUnity provides complete enough awareness to inform workers’ actions.

**More face-to-face communication.** A surprising result from our study was the observed increase in the proportion of face-to-face communications. The study also found that participants leveraged MyUnity to mediate the availability of communication participants and used the cues provided by the system to inform how, when and where to form a communication with colleagues. This observation suggests that MyUnity is helping workers efficiently select the most appropriate communication method. As system use continues, we will specifically seek to understand if MyUnity also helps to mitigate communication breakdowns.

**Useful controls to protect privacy concerns.** An important study result was that many participants did not enable all the features of MyUnity. On the surface this illustrates the need for and utility of the privacy controls. More deeply it shows that there is still value to an awareness system that does not require complete buy-in by all participating users. This interesting tension of awareness needs and privacy in awareness systems should be studied over a longer period of time and in additional settings and configurations.

Despite these promising findings, our study also revealed several opportunities to improve the design of the system. For instance, while users valued the view of all users provided by the dashboard, many participants indicated they would prefer an additional view that provided detailed information for a subset of colleagues (e.g., their specific project group). We plan to incorporate this alternative view into MyUnity.

Participants valued the visual salience of scheduled meetings in the dashboard but also wanted to know when those meetings would conclude, as such information would be useful in mediating a preferred communication channel. In subsequent iterations of the tool we plan to explore the design of forward-looking features and how they affect workers’ privacy concerns.

**CONCLUSION**

We have presented MyUnity, a new system that aids workers in building group awareness that is grounded in an understanding of workplace awareness needs. We performed an initial field deployment and found that it increased general awareness among co-workers, mediated communication between co-workers (specific awareness), and fostered an increased sense of community in the workplace. Our work provides an important step toward building a richer understanding of how to design awareness tools for the workplace and how such tools influence workplace communication and behavior.

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