# CoasterMe: Supporting Informal Workplace Awareness Through the Everyday Behaviour of Drinking

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## Abstract
Maintaining awareness of the presence of colleagues can be difficult when collaboration is distributed across separate offices. In this paper we present CoasterMe, a situated desktop widget that leverages the natural behaviour of drinking to support informal awareness of a colleague's availability in the workplace. A pilot field trial showed that CoasterMe helped coworkers to build in-the-moment awareness of availability and supported an improved understanding of work routines, enhancing social coordination and preventing wasted effort. CoasterMe also created a sense of co-presence and connectedness by making users feel as if they are sharing a drink over distance.

## Author Keywords
Coordination; Office awareness; Workplace communication

## CCS Concepts
**•Human-centered computing → Collaborative and social computing devices;**

## Introduction
Modern workplaces frequently involve collaboration between coworkers who are separated by physical distance. Teams may be spread across open plan offices, different levels of a building, or even geographically separated headquarters [16]. Under such settings, it can be difficult to

**Figure 1:** CoasterMe, a situated desktop widget that supports informal workplace awareness by detecting the presence of the user's cup. CoasterMe sends out a signal to a partner device to convey the user's presence at their desk, increasing awareness of availability and enhancing coordination.

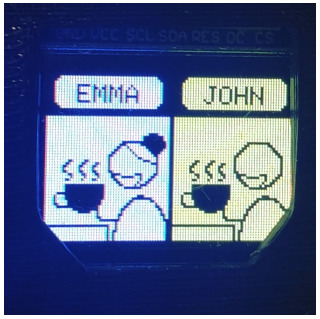


**Figure 2:** Close up of the status display in CoasterMe. The display lights up whenever the respective user places their cup onto the coaster. (Both names shown in the image are pseudonyms.)

maintain timely and efficient collaboration due to a lack of awareness about the presence and availability of one's colleagues [5, 11]. Awareness of who is around and whether they are available for conversation has long been recognised as crucial for supporting collaboration because it helps people to coordinate their work activities [7], preventing wasted effort and enabling social interactions that contribute to a productive work environment [9]. Although coworkers can build awareness by exchanging information through tools like instant messengers and email, the need for explicit communication via these tools has been criticized as distracting and time-consuming [13].

Previous research in HCI has attempted to resolve these problems through lightweight information-sharing systems that enhance coworkers' awareness of mutual availability. Examples include networked desktop displays that enable the sharing of drawings between coworkers [8] or systems which allow people to signal their availability by publicly sharing information about their daily schedule [17]. However, one drawback of these systems is that they demand effort from the user to provide information, which may detract from time spent on meaningful work activities.

Other studies have explored the strategy of implicitly detecting a user's presence to support workplace awareness. For example, MediaCup [2] used sensors to measure the temperature of a user's cup (and hence whether they were consuming a hot drink) as a way of identifying presence in the office. Researchers have also explored the potential to detect typing patterns [3] and physical proximity to the desk [14] to infer whether a person is working or resting. The drawback of these systems is that they are intrusive and require users to surrender fine-grained data about their activities, which may erode privacy and create a feeling of being monitored in the workplace [12].

In this paper we present *CoasterMe*, a system that addresses the limitations of previous designs by supporting awareness in a way that is *low effort* and which *upholds privacy and autonomy*. As shown in Figure 1, CoasterMe is a situated desktop widget that supports awareness by leveraging the natural behaviour of having a drink at one's desk. CoasterMe works by detecting the presence of the user's cup on the coaster. It then sends a signal to a partner device to show that the user is at their desk, causing a status display to light up (Figure 2). The system is intended to support collaboration by allowing colleagues to signal their presence to each other, enhancing awareness of availability and preventing wasted effort from checking whether a colleague is in their office. We describe the design and implementation of CoasterMe and report findings from a pilot field deployment in which two users trialled CoasterMe for 4 days in a real office setting. The contribution of the paper is the CoasterMe system alongside late-breaking insights into its perceived utility for supporting workplace awareness.

## CoasterMe Design and Implementation

The CoasterMe concept was generated in ideation sessions between the authors of this paper. Our aim was to explore new ideas for technologies to support awareness in workplaces. Inspired by previous work on augmenting office objects to support awareness (e.g. [2, 18]), we developed the idea for an 'augmented coaster' that allows people to signal their presence while naturally drinking tea or coffee at their desk, both of which are commonplace activities in a wide range of professional environments [2]. We arrived at the final design of CoasterMe through iterative sketching and storyboarding, which helped us to envision CoasterMe's functionality and how it might fit within an office setting.

CoasterMe has two distinct properties that address the limitations of previous solutions. First, CoasterMe is low

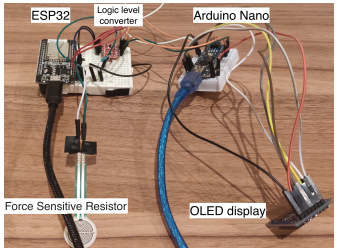


**Figure 3:** The internal components of CoasterMe include a 0.5 inch Force Sensitive Resistor, a 0.95 inch full-colour OLED display, an Arduino Nano microcontroller and an ESP32 microcontroller.

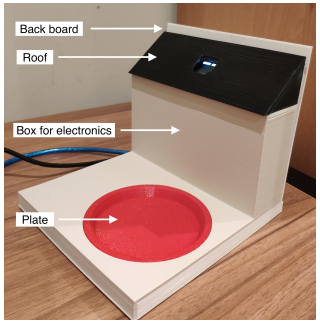


**Figure 4:** The 3D-printed shell.

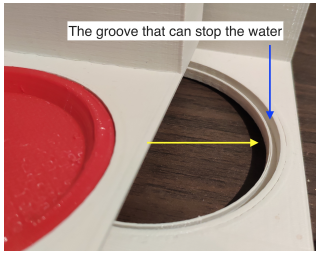


**Figure 5:** Groove design for waterproofing.

effort to use. The user only needs to place their cup on the coaster and no additional effort is required to share information. Second, CoasterMe is intended to uphold the user's privacy by sharing a minimal and largely ambiguous signal [1]. We designed the display to hint that the user is having a drink, without showing detail. This means that the colleague can infer that the user is at their desk without knowing exactly *what* they are doing, upholding privacy [9].

We implemented CoasterMe as a functional high-fidelity prototype to enable evaluation of our idea. The prototype consists of two identical coaster units that are connected via WiFi and a dedicated server. Figure 3 shows the internal components. CoasterMe's external housing is a custom 3D-printed shell with three parts: a box to hold the electronic components, a 'roof' for the display screens, and a plate to support the user's cup (see Figure 4). Since CoasterMe is intended to hold drinks, we designed a groove surrounding the plate of the coaster (Figure 5) to stop spilled liquid from damaging the internal components or causing electric shock. We tested CoasterMe with multiple cups to ensure a good match between the intended use case and the physical dimensions of everyday drinking vessels.

When using CoasterMe, the user can set their status as "On/Available" by placing a cup on the coaster. The weight of the cup exerts pressure onto a force sensitive resistor beneath the plate, which causes the status signal to appear on both devices. As shown in Figure 2, the left half of the display shows the user's own status and the right shows the status of the remote colleague. The user can then set the status as "Off/Unavailable" by removing the cup. However, CoasterMe has a 30 second delay in switching from On to Off, providing time for the user to drink from their cup without switching off the display. Figure 6 illustrates the operation and communication between two CoasterMe units.

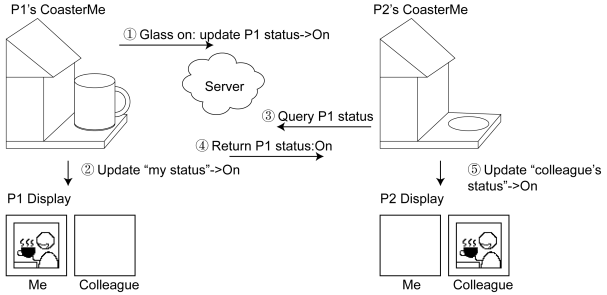


**Figure 6:** Communication diagram of CoasterMe. The diagram illustrates the system status when the first user has a cup on their coaster and the second user does not.

## Pilot Field Trial: Method

We conducted a pilot field trial to evaluate CoasterMe's ability to support workplace awareness. The setup of our trial was based on previous work that has produced rich data from pilot evaluations (e.g. [10]). We recruited two participants who trialled the system for 4 consecutive days. Both participants (P1 and P2) were researchers at our University. P1 identified as male and P2 as female. They both work in the same research group and recently started to collaborate on a project, necessitating occasional face-to-face discussion. However, their offices are four floors apart, making awareness low. There is also a time cost for them to visit each other and this time could be wasted if the visited researcher is absent. This means that there was clear practical value for them to see each other's availability. The participants were not paid for helping with the study.

We used pre- and post-study interviews alongside daily diaries to understand the use of CoasterMe. Sidebar 1 shows example questions from the interviews and diaries. We used interviews to obtain a grounded understanding of the participants' existing practices and to understand how

**Sidebar 1**

**Examples of pre-study interview questions:**
1. Can you tell me about the current relationship between you and your colleague?
2. What do you usually do if you need to find your colleague at work?
3. What is your preferred method of contacting your colleague?

**Examples of diary questions:**
1. What did you put on CoasterMe today?
2. Did you try to get in touch with your colleague when you noticed they became available?
3. What was your thought when you decided to put your cup/glass on CoasterMe?

**Examples of post-study interview questions:**
1. What are your main thoughts about CoasterMe?
2. Is there anything you want to share as feedback?
3. Do you feel CoasterMe ever disturbed your work?
4. Would you add any other functions to the system?

these practices were affected by CoasterMe. We used daily diaries to capture time-critical information [15] such as participants' thoughts and experiences with CoasterMe on that day, their reasons for using it, and their reactions to seeing the partner's status change. We also collected objective data in the form of timestamped log files to record the duration of CoasterMe use by each participant.

*Procedure and Analysis*
The study lasted four consecutive days. At the beginning of day one, each participant completed an individual pre-study interview with the first author. The interviews lasted approximately 30 minutes, were audio recorded and took place in the researchers' offices, i.e. where CoasterMe was deployed. After the interview, the researcher gave a demonstration of CoasterMe and answered the participant's questions. Participants were requested to use CoasterMe as often or as little as they wished for the next four days.

The daily diary was sent to the participants by email at 5pm on each day. The diary was filled out as an online form. The study was ended at 6pm on the fourth day and was followed by two separate post-study interviews, 30 minutes each. These interviews gathered information about awareness built over the course of the study and requested feedback from the participants. The coasters were retrieved after the study and participants were thanked for their time.

To analyse our data, we first cleaned the log data from the CoasterMe server, aggregating the status change into 30-minute time windows to examine patterns of use. We then transcribed the pre- and post-use interviews and combined them with the 8 diary entries (4 per participant). We conducted an inductive thematic analysis [4], using open coding and affinity diagramming to construct themes that describe how CoasterMe was experienced by the participants.

## Findings
Our analysis produced a rich understanding of how our participants used CoasterMe during the trial. Figure 7 shows the overall pattern of use, based on the server logs. It can be seen that the participants used CoasterMe both in short bursts and for long periods of up to 3 hours over the course of the study. However, the use patterns should be interpreted with caution given that periods of non-use may reflect participants either not using CoasterMe, being out of the office, or deliberately hiding their presence, all of which are in line with our design goals. Comments from the interviews and diaries suggested that our participants used CoasterMe to convey their presence and that periods of non-use reflected genuine unavailability. For example, Figure 7 shows that both participants' use was low on the third day. The post-study interviews revealed that this was because both participants had appointments outside of their offices and hence were not present on that day.

*Mutual Awareness and Communication Efficiency*
The main aim of CoasterMe was to support awareness of presence between remote colleagues. Before the study, the participants stated that they had a limited understanding of each other's presence at work, especially regarding typical office hours. As the study progressed, participants claimed that they were learning about their partner via CoasterMe. This may have been complemented by face-to-face conversation: *"I am thinking about how often my colleague is in the office. It seems like she is in 9 to 5 most days"* [P1, Diary Day 3]. *"He has tea after lunch and again at 4PM (I am beginning to notice patterns)"* [P2, Diary Day 4]. The information provided by CoasterMe was also described as helpful for coordination. On the second day of the trial, P1 visited P2's office because he knew that P2 was present from the CoasterMe signal. P1 stated that this was a positive experience, saying *"I didn't waste my time checking her of-*

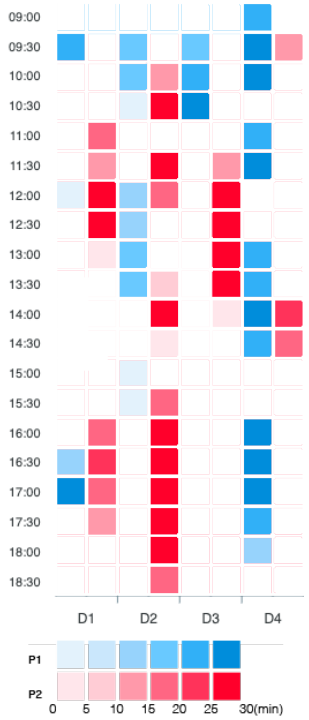


**Figure 7:** Use pattern for CoasterMe over the four days of the study.

*fice. I knew she was there"*. This indicates that CoasterMe can enable collaborators to acquire real-time awareness of availability and potentially become more aware of each other's daily work routine, making communication more efficient and preventing wasted time.

The participants also said that time-efficiency was an advantage of CoasterMe over other communication tools. P2 noted the shortcoming of arranging meetings by email or messaging: *"There might be a delay in their response.* [Email] *is a kind of overhead, especially when you are trying to get something done quickly"*. P2 mentioned the possibility of *"moving to one of the other communication mediums"* after seeing that someone is available through CoasterMe.

*CoasterMe Supported Natural Use*

We found that the common act of placing the cups on and off the coaster had two advantages. First, the participants could quickly form a habit of using CoasterMe since it was designed around an existing behaviour. On the third day of the trial, P1 mentioned in the diary *"I am getting accustomed to using the coaster whenever I am in the office"*. Second, the ease of interacting with the coaster gave the users more freedom in deciding when to use it. As P1 mentioned in the post-study interview, *"You can optionally engage with it. So I can put my cup on it if I want to signal my availability. If I still want to have my cup of tea, and I don't want people to come and bother me, I can just put it there* [next to the coaster]. *And it doesn't change anything"*. This speaks to our goal of allowing users to retain autonomy by choosing to reveal or hide their presence to a partner.

The participants' comments also revealed that they often appropriated [6] CoasterMe to signal their presence without necessarily 'having a drink'. For example, P2 described using a cup of pens to indicate her presence on the fourth day of the study, explaining that her drink was empty but P1 *"had just been in, and if he wanted to know if I was around I wanted to be visibly present"*. The participants also used other objects including a water bottle and an empty cola can to activate their display. This means that while participants may not have always used CoasterMe in the way we envisaged, the system had value in allowing them to convey general presence in line with their emergent needs.

However, an interesting side effect of using CoasterMe was that participants reported that they would sometimes forget to remove their cup when they had left the office. This means that CoasterMe could display a misleading signal, making the receiver lose faith in the information. One potential solution would be to include a secondary detection mechanism (e.g. a bluetooth sniffer looking for the user's phone) to ensure that the person is physically present before sending out the status signal. This may have implications for privacy, so represents an area for future work.

*Privacy Perceptions*

Participants described the ambiguity of CoasterMe's display as beneficial for supporting privacy, and valued the fact that CoasterMe did not reveal their actual behaviour. As P1 said, *"It doesn't tell anybody what I am doing. It just tells someone that I am at my desk"*. However, fluid interpretation of the coaster signals may raise the concern of being judged. In the post-study interview, P1 said *"I was constantly using it while I was in the office... I would wonder if somebody judges me if he thought I was actually drinking tea whenever I use it"*. P2 also noted that some people might *"feel deeply uncomfortable with this sense of being monitored"*. Our participants were comfortable sharing the information with each other because they had a collegial relationship, but these feelings could have broader implications for sharing presence and availability within the workplace, presenting another avenue for further research.

*Users Experienced Connectedness and Co-presence*
In addition to indicating presence, CoasterMe created a sense of connectedness that was reinforced by the display design, with the images of people having a drink creating a perception of co-presence in virtual space: *"There's a slightly social feel, you know, we are having a drink together"* [P2, post-study interview]. The participants subsequently wanted ways to acknowledge each other's presence through the device: *"I wanted to say hi"* [P2, Diary]. This suggests that CoasterMe could benefit from additional features to support lightweight phatic communication [19].

*Practical Issues for Augmented Coaster Designs*
The field trial revealed several technical considerations that affected use of CoasterMe. The first was that the plastic base plate turned out to be easily deformed by heat, which resulted in the coasters becoming less sensitive to the pressure exerted by the cup. Second, the full cup of water used by P1 and the empty cola can used by P2 had a large difference in weight. Our prototype did not adapt well to different weights because it only compared the current weight to a predefined threshold. Making CoasterMe detect the presence of the cup independently of the cup weight may help to increase the reliability of the system in future.

Answers received from the interviews suggested that CoasterMe was minimally distracting from work. However, when P1's coaster display started flashing due to a serial signal bug, he reported finding the screen annoying. The issue was resolved during the study but showed that the widget should not be disturbing. Another reported disturbing factor was the space occupied by CoasterMe. The current implementation of CoasterMe is rather cumbersome due to the limitation of the prototype, but future versions could be smaller or even embedded into the users' desks so that they are less intrusive in the work environment.

## Conclusion and Future Work

In this paper we have presented CoasterMe, a situated desktop widget that leverages the natural behaviour of drinking at one's desk to support awareness of presence and availability between remote collaborators.

Our pilot evaluation suggests that CoasterMe can help to establish real-time awareness by providing information about the presence of a colleague while also allowing collaborators to develop a high-level awareness of a partner's typical office routine. We also found that CoasterMe clarified opportunities for spontaneous conversation and helped to streamline interactions by preventing wasted time in checking offices for absent colleagues. In line with our design goals, the participants in our evaluation valued the fact that CoasterMe provided presence information without surrendering privacy. We believe that CoasterMe demonstrates how systems that leverage natural behaviour can enhance coordination between physically separated teams, supporting social processes in a way that is low effort and which upholds users' autonomy within the workplace [9].

In our future work, we intend to study the use of CoasterMe in longer term field deployments, allowing us to explore design issues that emerge in different working relationships and in different office environments. We will also explore how CoasterMe can be integrated with other digital workplace communication tools, such as by using the signal to update a user's status on *Slack*[1]. This will allow us to investigate how designers can extend information about physical presence into 'public' digital spaces without mitigating the feeling of control and protection of privacy. These investigations will result in a more comprehensive understanding of how everyday behaviours can be leveraged to support awareness in the workplace.

[1] https://slack.com

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