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# Ritual of Everyday Digital Life: Towards Human-Centred Smart Living

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## Abstract

**Background** For many years, system designers have endeavored to synchronise users' routines with home assistant devices. While the prevalence of routine in daily life is clear and obvious, routine-embedded automation has yet to take off. In this study, we propose a 'ritual' as an alternative framework to approach the design of digital media-engaged smart living. Rituals are purposeful actions that are voluntarily performed with a degree of formality and seriousness. Thus, in this study, we seek to find common vocabularies that are used in the descriptions and formations of quotidian rituals in everyday life. We suggest design implications for human-centred smart living and rituals for digital communication applications.

**Methods** Our method is qualitatively driven to investigate varying degrees of digital engagement in people's everyday lives. We designed the ritual probe: a physical packet containing various inspirational materials. The study was conducted in the UK, where we recruited 10 people living in varying household types. A probe kit was given to each participant, and they were encouraged to use the kit for as long as they wish and return it within one month. Follow-up in-depth interviews were held upon the return of the probe kit.

**Results** Collected sets of rituals in secular and quotidian contexts span various continuums of actions. Through the use of a ritual diary, participants made clear distinctions between ritual and routine. We could draw out initial lexicons of rituals that people use in either private or social contexts. Also, we found that digital media devices are purposefully incorporated in rituals to effectively manage personal tasks, plans, and resources, as well as to connect with intimate others who are in different places.

**Conclusions** Rituals are realised as a linkage of episodic interactions, which are methodically conducted for explicit function, implicit comfort, or both. Our study suggests an avenue to apply attributes of rituals in the design of smart agents enabled smart living.

**Keywords** Ritual, Internet-of-Things, Home Automation, Human-Computer Interaction, Human Communication in ICT

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## 1. Introduction

Digital communication technology has permeated into every part of our lives. Mundane products such as kettles, lamps, and coffee machines are increasingly becoming 'smart', now having the ablity to communicate with other devices and their environment. For many years, home assistant applications have emerged with the connected smart products to support home automation, based on users' personal routines (e.g. Google Home Routine and Amazon Alexa Routines). While the automation promises easy, convenient, and enjoyable management of daily life, broader adoption within our daily lives is still very slow due to high cost, inflexibility, privacy concerns, and poor manageability (Brush et al., 2011). This also applies to Internet-of-Things (IoT) applications: only a few cases have taken off and been employed widely[1)]. Here, we doubt the efficacy of 'routine' in the integration of home automation design due to its characteristic - mindless repeation. Contrariwise, in our ordinary lives, we select and enact actions in stylised forms, which we call 'rituals'. From one's life events (e.g. birth, marriage, retirement, and death) (Gordon-Lennox & Russo, 2016) to daily encounters with intimate or strange others (Goffman, 1982) and domestic consumption (Miller, 1998), rituals serve to hold the drift of meanings within a concise framework (Douglas & Isherwood, 1996). Thus, domestic life is ritualised even if we do not decide to do anything special (Grimes, 2013). Hence, we turn our focus from the functional aspect of routine (repeated actions) to the more human-centredness of digital engagement to draw out design implications for connected products, or namely, smart living. We posit that home automation design requires consideration of interaction between dwellers, meaning of actions, and orderliness of events. In this paper, we explore the concept of a ritual – with no reference to its religious connotations – of everyday 'digital' life by looking into how people perform, manage, and maintain their meaningful activities. Also, we will focus not only on personal rituals but on currently prevailing ways of social interaction and exchange that are mediated by digital social media to examine digital inventions in social rituals.

This study is rooted in a broad area of Human-Computer Interaction (HCI) while focusing on the human-centred design of digital communication. The main contributions of this study are twofold. Firstly, we bring the notion of ritual, which contrasts with routine and habit, to the realm of design and HCI. In doing so, we refer to a body of works in anthropology and social science to borrow the ritual lens for observing information and communication technology (ICT) applications to understand individual users' organisation of their everyday lives in both personal and social contexts. Moreover, our findings are intended to inspire designers who wish to engage with the design of rituals for digital communication technologies, especially in the area of IoT and home automation.

1) 7 Reasons Why the Internet of Things Is Doomed. https://www.wired.com/insights/2014/07/7-reasons-internet-things-doomed/

## 2. Background

A ritual is often perceived as a matter of special activities closely linked to the sacredness of tradition and religion (Bell, 1997). Thus, rituals have received unsurprisingly little attention

in HCI and design literature. Only recently, Kirk et al. (2016) proposed bespoke phatic devices reflecting family rituals that support mobile workers communicating with their family members at home. 'Routine' is often used as a synonym of ritual that frequently appears in the lineage of works undertaken in Ubiquitous Computing (Weiser, 1994) and HCI. Tolmie et al. (2002) examined the fundamental nature of 'routines' in our domestic environment and identified design issues around what will be required in developing 'unremarkable' computing systems. Scholars have claimed the importance of taking domestic routines into account in the design of smart home technologies (Crabtree, A. & Rodden, T. 2004; Davidoff, S., et al. 2006). There are a body of works that have explored the design space of a routine assistant in smart homes (Chiang, Y.S., et al. 2020), supporting routine tasks (Crabtree, A. & Rodden, T. 2004), and in the use of shared intelligent agents (Park, A. & Lim, Y., 2020). To many researchers, designing for the domestic setting has been noticed challenging since it comprises a mixture of heterogeneous activities of mulitple dwellers (Garg, R., & Cui, H., 2022), which always entail the situated meanings that are different between each dwellers (Dourish, P. 2001; Suchman, L.A. 1987). Routines are often perceived as repeated tasks that can be supported by intelligent agents that automate actions and context. HCI researchers have also studied the possibilities of inaccurate automated actions and the subsequent issues that would arise from the use of such a system. Here, we see the limitation of routine as a technical means in the design of domestic living. Thus, researchers emphasised context-aware design by seeing the orderliness of actions (Suchman, L.A. 1987) and by characterising the situation of entities (Dey, A. K., et al. 2001).

Ritual has been far from the mainstream of HCI, few studies can be found in areas where researchers have taken ritual as a source of inspiration in the design of digital interfaces or artistic expressions (Hamidi et al., 2012). Researchers have explored novel approaches to design tangible interfaces to support existing ritual practices (Mah et al., 2020) and sought out opportunities for digital technology to facilitate the sharing of spiritual experiences (Uriu et al., 2021). In mobile communication, there is an emerging body of works that focuses on ritual interactions in our secular life as a way to frame meaningful user experiences in the design of social and cultural behaviours through digital media[2)]. Taylor and Harper's investigation of teenagers' mobile texting patterns and how some texting was considered a ritual-like interaction has been a foundational work in digital communication (Taylor & Harper, 2002). More recently, as social interaction has increasingly become digital, researchers are raising questions around how rituals should change accordingly and how rituals can influence human relationships. While most HCI research focuses on retaining and sharing online digital contents (Golsteijn et al., 2012), Sas et al. (2016) explored how digital media assists the rituals of letting go through digital disposal by reflecting on grief therapy.

Given that ritual is a niche area in the field of design and HCI, compared to how routines were taken into account, we designed our study to find a code or common language that describes quotidian rituals of digital life. In the following section, we describe the details of our research method.

2) Ritual Design Lab. https://www.ritualdesignlab.org/

## 3. Research Approach and Method

The main goal of our study was to sensitise participants to reflect on and account for their own experiences. Thus, we designed a ritual probe: a physical packet containing various inspirational materials. It was intended to facilitate participants' autonomy to educe latent rituals while they act out daily practices and to support them in retrospectively annotating meaning and value implied in the rituals. From the outset, our approach resembles the cultural probe's open-ended and provocative glimpses into people's local cultures that was initially developed by Bill Gaver and his colleagues (Gaver, Dunne, & Pacenti, 1999). The applications of the probe have proliferated widely in the design and HCI community (Boehner et al., 2007). Probe techniques are broadly analogous to ethnography, in terms of their reliance on participants' perspectives on their everyday lives, as well as their attempt to understand how they experience what they do (Olson & Kellogg, 2014). Additionally, in our study, follow-up interviews played a critical role in examining participants' points of view in discerning rituals across secular and quotidian contexts, distinctive to habits. In what follows, we will describe the design of the ritual probe and our praxis of ethnography-inspired interviews to study rituals in quotidian social actions mediated by communication technology.

### 3. 1. Ritual Probe

The aim of our probe was to effectively elicit participants' quotidian rituals and collect reasons why such actions are legitimised as rituals from 'their point of view'. The ritual probes kit (Figure 1-a) consists of a bespoke diary booklet (Figure 1-b), five activity cards, photo frame cards (Figure 1-c), bespoke index stickers (Figure 1-d,e), and other miscellaneous items. The diary (Figure 1-b) is a portable A6-sized brochure type booklet and the kit was packaged in a A5-sized plastic pocket (Figure 1-f). The diary booklet guided the data collection and interview throughout. The object of the booklet was twofold: it was a probe material that was intended to sensitise participants and cause them to reflect on their local cultures, as well as to draw out information to inform design insights. We drew upon the body of knowledge in ritual theory to ground our design of the ritual diary.

**Figure 1** (a) Contents of the probe kit; (b) Inner page of the ritual diary; (c) Photo frame card to be used with mobile phone camera; (d) Miscellaneous bespoke stickers; (e) Bespoke index stickers; (f) Probe kit packed in a A5–sized plastic bag.

Particularly, we referred to Grimes' seven ritual elements (Grimes, 2013) and Gordon-Lennox et al.'s creative process of developing secular ritual (Gordon-Lennox & Russo, 2016) to extract four categories – occasion, artefact, action, and relationship (involving others) – that underpin our analysis of rituals in quotidian contexts and digital communication.

We then selected 14 images from a free stock photo database that fell into the four categories and placed them on the left side of the diary (Figure 2-a: left). The images are by no means exhaustive; they are rather used as an inspirational tool. The opposite page (Figure 2-a: right) gathers essential information of each ritual that serves as a placeholder in the follow-up in-depth interview (e.g. Context, Time, Place, Frequency). We were also aware that actions display degrees of ritualisation (Grimes, 2013) and rituals utilise a similar kinesis vocabulary as habits (J. W. Turner, 1992). Thus, having participants assess how seriously they take the ritual (seriousness) and how purposefully they repeat the ritual (obsessiveness), we could re-examine whether the behaviour falls into 'ritual' or 'routine' and 'habit'. The booklet has additional blank pages for participants to add other types of rituals (Figure 2-b).

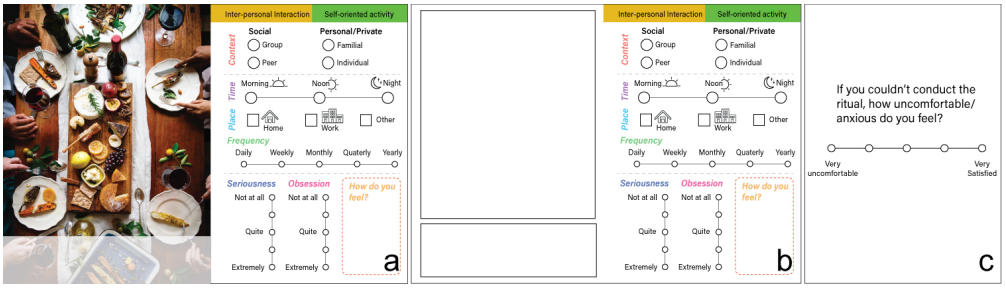


**Figure 2** Example pages of the diary booklet. (a) Photo of a dining table and description page. (b) Blank page. (c) Uncomfortableness/anxiety rating card. (All photos in the booklet are license free.)

Table 1 Demographic information of participants

| ID | Occupation | Age | Gender | Household type |
|---|---|---|---|---|
| P1 | Researcher | 30 | M | Couple |
| P2 | Lecturer | 37 | M | Single |
| P3 | Graduate student | 28 | M | Married, with no children |
| P4 | Admin officer | 55 | F | Married, two adult children (not living together) |
| P5 | Graduate student | 27 | F | Married, with no children |
| P6 | Graduate student | 33 | F | Married, with no children |
| P7 | Graduate student | 24 | F | Single |
| P8 | Lecturer | 35 | F | Married, with a child |
| P9 | Graduate student | 32 | F | Single |
| P10 | Lecturer | 48 | M | Single |

## 4. Study

The study took place at the UK site, where we were able to gather multi-national participants. The setting helped us to understand the general overview of how people form, select, and maintain rituals with digital technology, regardless of their cultural background.

We recruited 10 people who were living in varying household types. Demographic information of the participants are shown in Table 1. Participants were encouraged to use the kit for at least 10 days and anything other than the diary booklet was instructed as being voluntary. In addition to the diary, unlike traditional probe kits provided a disposable camera, we asked participants to use their own mobile phones to take photos and placed a 'frame card' in the kit to evoke participants to capture their rituals. Photos were shared with the researcher during and after the interview. Interviews were held 2–4 weeks after they received the kit. All participants were interviewed when they returned the probe kit. The interview was framed by the key elements of ritual taken from Gordon-Lennox and Russo (2016) and conversations were guided by the participants' rituals as denoted in the diary booklet. Interviews were held individually by appointment in a university meeting room, lasted approximately 50 minutes to one hour, and were audio- and video-recorded for later transcription.

Table 2 Interview procedure and summary of questions.

| | | |
|---|---|---|
| **Part 1. Categorising Rituals (approx. 15 mins)** | | |
| Categorise rituals into (1) Seriousness, (2) label the ones that involve digital means, (3) also label the ones that involve interpersonal interaction. | | |
| **Part 2. Interview – Rituals (approx. 35 mins)** | | |
| 1. Drill down to each ritual, starting from the most serious ones, with following questions in six sections. | | |
| Occasion | (Needs) Why do you need this ritual? / How did this ritual come into being? / Ritually considered, is there anything one should not do? | (Context) How app–less or app–specific is the ritual? / On what occasion do you perform this ritual? |
| Artefact / Action | (Sensemaking) Particular part of the ritual you actively (intentionally) seek/sought, create(d), and take/took meaning? | (Content) What is treasured? / Sound/Music Object involved? / Any meaningful words, gestures, emojis? |
| Relationship | (Coherence) Which are least ritually significant? / Which values are reinforced by the ritual? | (Roles) What is your role in the context? |
| 2. Present discomfort rating card after reviewing each ritual. | | |

Each participant received a £10 Amazon voucher as compensation after the interview. The interview was formed of two phases: (1) categorising ritual cases, and (2) elaborating on each ritual in detail. Interviews began by categorising rituals into seriousness ratings and labelling the ones that involved digital means and interpersonal interaction. The in-depth interview followed, by going through the rituals part-by-part in order of the ones that the participant took the most seriously to the least. After each revision, we presented a card for informants to rate their discomfort when they fail to conduct the ritual (Figure 2-c). We referred to Lewis' (1988) formulation that discerns ritual from routine: 'Must X do Y in Z circumstances? (X: actor, Y: ritual, Z: context) If a response is yes, it may be a ritual; if no, it cannot be a ritual'. Thus, the discomfort rating offers an additional filter that differentiates the ritual to other unconsciously repeated habits and actions. Table 2 shows the key interview questions that guided the interviews throughout the study.

## 5. Findings

Probes were returned after varying degrees of engagement. The in-depth interview helped participants to comprehend the ritual aspects of their daily lives and in social interactions. In reviewing rituals in the interview, we drew on Lewis' (1988) anthropological approach that discusses the behavioural or communicative qualities of a ritual *from an actor's point of view*. So, while some daily activities seem trivial to researchers, it was noted as an important ritual to the participant. Also, some rituals had been recognised or dismissed as rituals in the course of the interview. We fully transcribed the interviews (approximately 610 minutes in total) and analysed via thematic analysis (Clarke & Braun, 2014) to distil themes across the entire data set. The author performed an affinity analysis (Beyer & Holtzblatt, 1999) and the themes were iteratively refined through several collaborative data sessions in the research lab. In the following section, we will elaborate on our findings and analysis from the interview study. All names have been anonymised in the quotations.

### 5. 1. What Constitutes Rituals in Quotidian Life?

Collected sets of rituals in secular and quotidian contexts span various continuums of actions from the social to the private, the routinely to the rarely, and the periodic to the irregular (Table 3). Above all, almost every participant had rituals that have been purposefully created or spontaneously developed around managing and controlling one's time, day, or resources (e.g. money). Securing a block of time on weekdays or during the weekend to ritually spend on relaxing or grooming (e.g. P3, P5, P7, P8, and P9) and managing weekday work hours using an app (P6) seem to have purposefully been repeated by participants to reassure themselves of being in the same rhythm of their everyday life. Regularly checking bank accounts through a mobile app (e.g. P3, P4, P10) was seen to contribute to their sense of security. Some activities were doubtful to be considered as rituals: they seemed very mundane and habitual (to the author), and less seriously undertaken. However, for participants, these were still regarded as rituals and meaningfully treated as they implicitly enhance their comfort or relieve anxiety (Homans, 1941). Furthermore, many rituals under the interpersonal realm were related to affirming social and familial bonds by keeping in touch. Accordingly, social or familial rituals accompany mutual codes between participants. For example, such rituals had labels, which were named after a food they used to eat (P2), a TV program involved (P4), or a combination of participants' names (P6). Some rituals were driven by social awareness both in the physical (P5 felt obliged to receive a present) and digital (P8 committed to responding to friends on social media) realms, given that it implies obligation in one's behaviour. It was notable that rituals in this study had some distinctive characteristics that resonate with the extensive body of literature around ritual studies (Bell, 1997; Gordon-Lennox & Russo, 2016; Grimes, 2013; Lewis, 1988; Malinowski, 2013; Moore & Myerhoff, 1977; J. W. Turner, 1992; V. W. Turner, 1982). They are voluntarily performed behaviours, prescribed actions, and persistent habits that are purposefully repeated over time. In the following section, we will delineate elements that constitute part and parcel of the rituals realised in the quotidian parts of life.

Table 3 Elements of rituals commonly denoted by participants in the interviews. (*Appeared in both areas of ritual category)

| Personal/Private Rituals | Interpersonal/Social Rituals |
|---|---|
| • Manage/control/organise one's time, day, or resources. *<br>• Connect the present to the past<br>• Generate feeling of comfort and security | • Joining the individual to the collective<br>• Being (remotely) connected<br>• Labelling (Naming)*<br>• Negotiating<br>• Exercising social awareness/obligation<br>• Marking occasions (e.g. Christmas, birthdays) |

### 5. 2. 'How' overrides 'What' and 'Why'

How to conduct a ritual is explicitly prescribed while the meaning is implicit (Lewis, 1980). P3 is a graduate student living with his wife. P3 ritually creates a cooking list and a shopping list (Figure 3-a) before they go grocery shopping. He emphasised that the cooking list should be equally divided into eight sections and the shopping list should be divided into three sections (Figure 3-b). This somewhat resembles the layout of the physical supermarket. Orderliness of folding the papers was an important part of the ritual. (P3) *'To the point that I developed an entire folding system, I mean it's not exactly very sophisticated. [...] I would say this is probably one of my greatest obsessions and it's also quite relaxing. Like, you really have to stop [anything else] and do it'*. P3 recalled that this ritual had been derived from his passion for cooking, but now, folding paper is placed at the centre of preparation of cooking and the whole ritual. P3 recently made a minimal adjustment after negotiating with his wife on the categories for each section. But the 'folding ritual' had been sustained and kept for the longest duration among the rituals he had.

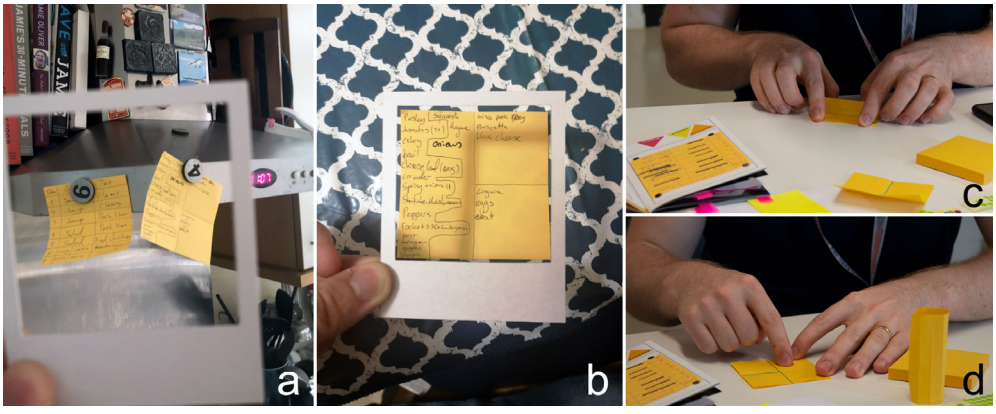


**Figure 3** (a) A cooking list and a shopping list adhering on P3's cupboard. (b) Shopping list divided into three sections. P3 demonstrating how to fold the (c) cooking and (d) shopping list.

P7 is also a graduate student living in a shared flat. She created her morning ritual with a radio alarm (Figure 4-a). She had bought the alarm clock one year previously. The radio sound had become an essential element of her ritual that offers a sense of connectedness, 'a feeling of "already into the world"', which became the most important part of the ritual above 'getting out of the bed'.

(Researcher) *'What is the least significant part in this ritual'?*

(P7) *'Maybe actually getting out of bed. [...] it's not like I immediately have to get out of bed, when I hear it. Even though it's an alarm and that's what should be the most important, but it's the least important for me'.*

P7's radio alarm was an instrumental part of the ritual and taken seriously (Figure 4-b), which would not be replaced by other means, such as a mobile phone alarm. Thus, long-term disengagement with the ritual would prompt relatively high discomfort (Figure 4-c).

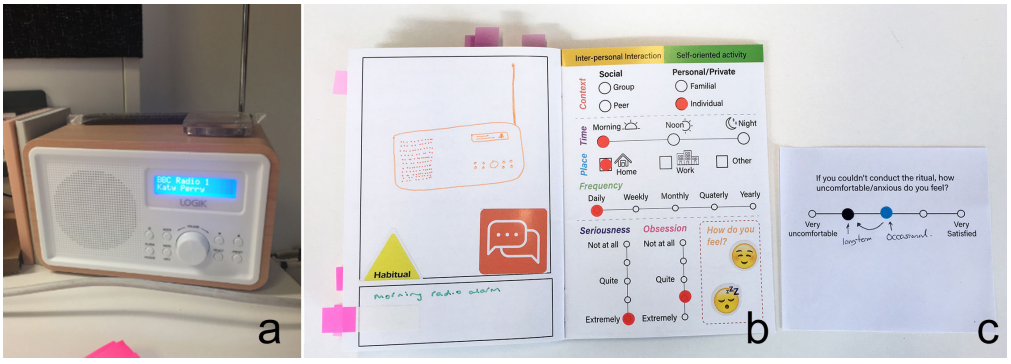


**Figure 4** (a) P7's radio alarm clock. (b) Corresponding ritual diary page. (c) Discomfort rating for long-term disengagement (black)

### 5. 3. Digital Intervention in Stylised Flux of Events

Rituals that participants took most seriously were often described as a condensed and fixed episodic sequence that they have repeated over time.

P3 has a ritual that related to caring for his wife who had moved from her home country after they got married. Taking coffee from his office was a symbolic element in his ritual that represents their bonding. (P3) '[...] *It's actually part of a larger stop-working ritual. So, I will stop working, I'll turn on the coffee machine, put the capsule in and press it, and I'll do all my other things while it's pouring. It's got a lot of emotional attachment'. P3 also has another ritual contingent to the 'stop-working ritual'.*

He uses Google Home as a communication agent when he is heading home (Figure 5). *'I tell Google "I'm going home", [...] it broadcasts a message out of the speaker and [...] it will tell her that I'm coming home. [...] I just have this thing that I know it will get to her'*. P3's 'stop-working ritual' entails the 'coffee brewing ritual', which also links to the 'broadcasting ritual'. P3's ritual has been developed systematically within the circumstances and addition of the new device. P3 noted that he also recently incorporated the Google Home Assistant in the 'folding (shopping list) ritual'. He tells the speaker miscellaneous things around the house to add to the shopping list. P3 remarked, *'It's like a backup in case I forget to put it on the shopping list'*. This reflects the assumption that people make use of digital means to help themselves manage their existing rituals.

**Figure 5** P3's Google Home Assistant associated ritual.

P8, who had recently bought a smart TV, had a ritual in the evening after she puts her one-year-old baby to sleep. She articulated the orderly manner of the ritual (Figure 6). (P8) *'[...] after I come out of the baby's room, I put [snacks] in the fryer and then take a shower. It takes about 10–15 minutes to fry. So, I take a shower during this time and then I take the snacks out and then sit down on the sofa [then watch Netflix]. [...] There shouldn't be any time wasted. It has to be all planned in that order'.* Her ritual has clear indications of beginning (Baby having fallen asleep) and ending (Watch Netflix), seen as an episodic event. She was very meticulous about the order, as well as the elements involved in the ritual. For example, the snack could neither be prepared too early, too late, nor opted out of. Also, she was always watching the same Netflix series that she had already seen many years ago. Thus, she rated the discomfort in the extreme (Figure 6-b: Black sticker) if she were to miss one part of the whole ritual, while feeling less anxious when unable to start the ritual from the beginning (Figure 6-b: Red sticker).

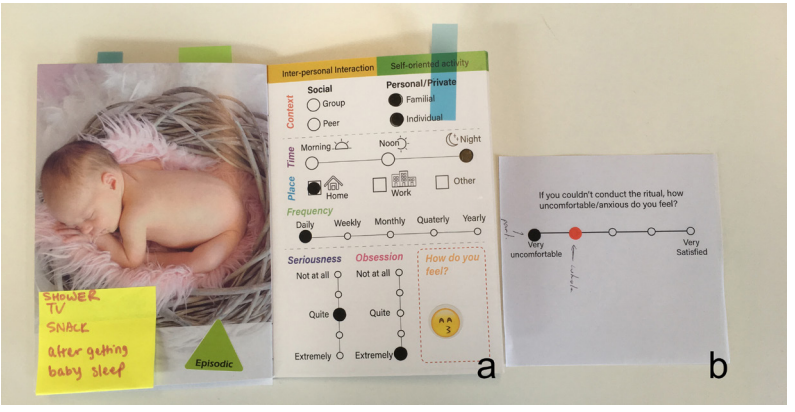


**Figure 6** (a) P8's evening ritual noted in the diary. (b) Discomfort rating for missing a part of the ritual (black) and skipping entire ritual (red).

Likewise, P4 identified a collective ritual that happens every morning. Upon waking up, she texts her daughter, checks her bank account, catches up on news, and feeds her pets. P4 remarked, *'It wouldn't feel right if one of them didn't happen. But out of all of this, the two*

*that would have to happen is that (texting her daughter) and that (feeding her pets), because at some point of the day I could catch up on the news and the banking*'. Interestingly, though it was favourable to have every part of the ritual in place, there were priorities between the actions which construct a frame of the ritual. We saw that digital devices reside in our everyday rituals with a degree of involvement. Also, some essential parts take place simultaneously in the background and confluence at a certain point of the mainstream of the ritual (Figure 7).

In summary, our findings project a broad picture of elements of quotidian rituals and how they are comprised. Rituals are realised as a linkage of episodic interactions, which are methodically conducted for explicit function, implicit comfort, or both. Also, digital media is incorporated to effectively manage rituals with regard to personal tasks, plans, and resources, as well as to connect with intimate others in different places.

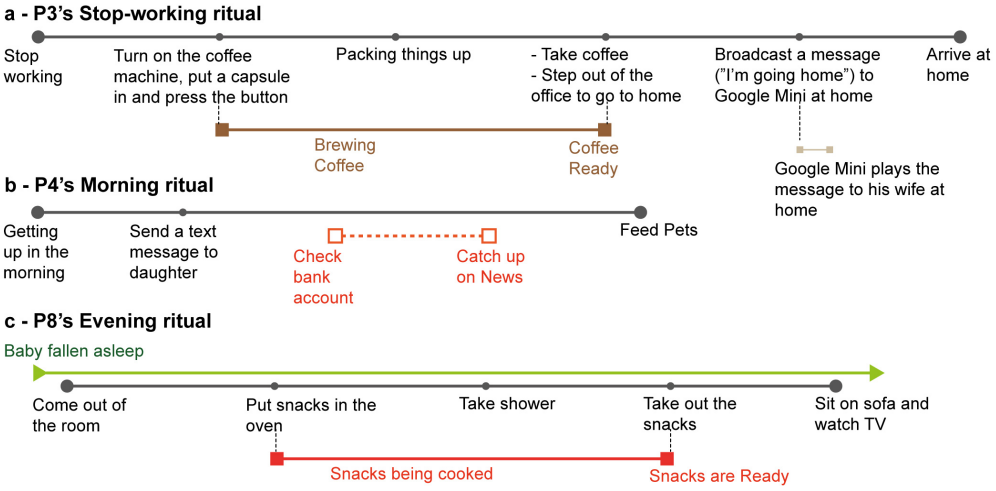


**Figure 7** Rituals illustrated in a sequential manner. (a) P3's Stop–working ritual synchronised with 'coffee brewing' and 'voice messaging' rituals. (b) P4's Morning ritual showing essential and floating parts. (c) P8's Evening ritual depicting the strict orderliness.

## 6. Discussion

Findings from our study have shown how digital devices and applications have either permeated into participants' existing rituals or enabled them to develop new rituals that became imperative to maintain their "behavioural grooves' (J. W. Turner, 1992). In the early days of ubiquitous computing, P. Tolmie et al. (2002) observed the prevalence of routines in domestic life and how significant they are to our everyday lives. At the same time, however, routines are deeply 'unremarkable' whereas, characteristics of rituals found in our study show directly the opposite stance. Unlike technical mundane routines, rituals are episodic event strings, dramatic, multi-layered, and offer emotional satisfaction when conducted successfully. In our study, participants claimed that rituals were often seriously taken into account compared to other daily routines. If the rituals were unsucessfully conducted, participants expressed that they would feel uncomfortable, whereas that would not be

so in the case of routines. Thus, we argue an alternative view to the functional IoTs, one that focuses more on multiple dwellers' meaningful actions, as well as social interaction between household members who share devices and their domestic environments. We argue that the design goal of domestic IoT or smart homes should focus on augmenting the actions, resources available to the actions, and orchestrate the actions of multiple users. For example, one of our participants had a 'stop-working' ritual that related to brewing coffee, broadcasting his journey through the smart speaker, and making his wife aware of his status, which leads to his wife making a plan for their evening. If this set of actions was a mundane thing, he could have just pre-programmed the Google assistant's Routine function to notify his wife that he is way back home or, he could just call or text her. But in their ritual, how the action is performed is more important than what has been done. Thus, the voice agent was an instrumental part of the ritual and was involved as a means to coordinate actions and make other actors (in this study, P5's wife) aware that the ritual has commenced. This is different from other approaches using intelligent systems to complete a certain task on behalf of the users. Here, we see the value of tangible objects (as in a standalone voice agent not the one in the smart phone) in structuring family ritual activities, which has been demonstrated by previous works in terms of occasions (e.g. Christmas) (Petrelli & Light, 2014) or familial structures (Kirk et al., 2016). We suggest the design of smart lights, themostats, and cameras as media that makes other dwellers proactive by triggering people to engage more actively in what is happening (Rogers, Y. 2006). Portet, F. et al (2013) claimed that the designers of smart homes should consider giving users the ability to control more rather than positioning intelligent devices and systems away from the users' attention. We envisage that the area of customisable IoTs (De Roeck et al., 2012) or programming personal rules platform (e.g. IFTTT) can be incorporated in the design of pertinent smart home interaction rituals. Cho, H., et al. (2021) demonstrated tangible IoT switches that can be managed by a mobile platform. Such physically augmented IoT triggers (Ammari, T., et al. 2019) appear to have a great potential in creating a chain of tacit practices around the home between dwellers (Petrelli & Light, 2014) or even with remote family members (Hassenzahl et al., 2012; Kirk et al., 2016) that can bring communicative value to the fore of computer mediated interaction. Here, the communication may include intelligent products asking for permissions from users, dwellers commencing negotiation, and coordinating their future actions based on the current situation.

Moreover, we also probed the potential of a voice assistant in the design of a ritual embedded smart home environment. Ammari, T., et al. (2019) investigated how users engage with conversational agents or voice assistants in their everyday life. Their study has shown that people seemed to actively integrate or were willing to incorporate the voice assistant into their daily routines, both private (e.g. to search while cooking) and social (e.g. listening to music with others) activities, depending on the context they are situated. Domestic enviroments are not identical and the dwellers do not live in the same way (Bell et al., 2003), even the similar mundane routines are differently fashioned by each individual. Users who placed a voice assistant in the living room will use the device differently from the one placed in the kitchen or bed room. Voice assistants are becoming increasingly intelligent and could learn a user's voice over time and distinguish between the family members. Designing the custom voice as a trigger of one's ritual would make the smart home truly personalised to the user. Current smart assistant devices are made to answer one question or perform one action

at a time (Bentley, et al. 2018). This study has shown that one's rituals are constructed and performed in a linkage of actions to create an episodic event. We envision future systems that learn a link of commands by categorising the state and context to support a user's complex ritual and interact in more a human-centred manner.

## 7. Conclusion

This study began with an assumption that a ritual lens would offer a human-centred perspective in observing how digital media and ICT applications are influencing people's organisation of meaningful actions and interactions to feel comfortable and secure. We designed and conducted the ritual probe, followed by in-depth interviews to capture elements (occasion, artefact, action, and relationship) of quotidian rituals. Findings from this study advocate that ICT applications, including IoT devices and home automation services, should consider ways to incorporate user-centred rituals, which are often expressed as a linkage of purposeful behaviours not given over to technical routines. From this study, we hope to open a discussion in the design and HCI community on the ritual dimensions of designing computing systems that have a latent impact on the personal management of both one's private and social lives.

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Appendix

Ritual Probe Kit

Ritual Diary Booklet

Ritual Kits in plastic bags

One of the inner page in the booklet

Photo cards to prompt latent rituals