Places for News: A Situated Study of Context in News Consumption

Yuval Cohen[1], Marios Constantinides[2(✉)], and Paul Marshall[3]

[1] Interaction Centre, UCL, London, UK
`yuval.cohen.14@ucl.ac.uk`
[2] Department of Computer Science, UCL, London, UK
`m.constantinides@cs.ucl.ac.uk`
[3] Department of Computer Science, University of Bristol, Bristol, UK
`p.marshall@bristol.ac.uk`

Abstract. This paper presents a qualitative study of contextual factors that affect news consumption on mobile devices. Participants reported their daily news consumption activities over a period of two weeks through a snippet-based diary and experience sampling study, followed by semi-structured exit interviews. Wunderlist, a commercially available task management application and note-taking software, was appropriated for data collection. Findings highlighted a range of contextual factors that are not accounted for in current 'contextually-aware' news delivery technologies, and could be developed to better adapt such technologies in the future. These contextual factors were segmented to four areas: triggers, positive/conducive factors, negative/distracting factors and barriers to use.

Keywords: News consumption · Mobile · Snippet technique · Context awareness · Contextual factors

1 Introduction

News consumption is changing rapidly thanks to digital methods of consumption, reinforced by almost ubiquitous handheld mobile devices. Social networking platforms such as Facebook, Twitter and even direct messaging platforms such as WhatsApp and Snapchat are becoming de facto distribution channels for news stories. This wrests control over how news is presented to and consumed by users away from publishers [40]. Furthermore, news content is increasingly being presented in a 'contextually-aware' fashion, according to topics and locations.

While there has been a significant concern about and analysis of how emerging news consumption patterns can lead to the formation of 'filter bubbles' [41,45], and how fake news stories spread through social networks [33], there has been little focus on understanding exactly how social and personal context affect news consumption habits (cf. [22]). The study presented in this

paper first aims to identify contextual factors relevant to news consumption, especially those of a more qualitative and experiential nature, which have typically been overlooked in previous research. Such research often defines context quite broadly [1] but tends to focus on objective quantifiable aspects of context, such as geographical location [19]. Our aim is to focus on what contextual factors are important prior to trying to use sensor data to identify them. Arguably, prior work has tended to focus on those contextual factors that are straightforward to measure rather than most salient from the users' perspective. Furthermore, the study aims to explore the effects of any identified contextual factors on user behaviour related to news consumption, and the influence it has on the news consumption experience.

Our findings highlight a range of social, cultural, affective and individual factors that drive the manner in which users consume news. We discuss these in relationship to opportunities for the development of new types of context-aware and adaptive news applications.

2   Background

2.1   Mobility and Context in HCI

The shift towards consumption on mobile devices is not an isolated phenomenon within news consumption, and can be categorised as part of a larger trend described by social scientists as a 'mobility turn' [56]. This perspective recognizes that human interaction with technologies is increasingly distributed over both time and space, and occurs in disparate social and physical contexts. Dourish and Bell [23] focus on mobility in the context of urbanism, and treat it as a spatial construct in which individuals render a space meaningful by acting in a certain way. Some approaches in social sciences describe a set of codes that govern interactions or non-interactions between individuals in public spaces [25]. Other perspectives, more relevant to the current study, have focused on the role of technologies in the isolation of individuals from their environment, creating "solitude and similitude" [3,26].

An additional area of mobility research is studies of mobile work. While news reading can generally be considered a non-work task, studies of mobile work have the potential for generalizable insights. For example, Perry et al. [46] note the existence of 'dead times' – periods of time which workers spend riding various forms of transportation or waiting for them to arrive, which creates opportunity for news reading on mobile devices [20]. Other studies have focused on issues such as battery life, connectivity and device limitations–all issues with relevance to everyday mobile information needs [10]. User experience of news applications has also been studied, particularly within the young generations, revealing factors such as quick understanding, consistency, fun, diversity, and interests [57].

A large body of research in relation has focused on context in the development of recommender systems. A comprehensive review of the state-of-the-art news recommendation systems can be retrieved from [30]. In addition to particular challenges of news recommendations (e.g., recency aspects), the advanced

capabilities of today's smartphones open a new road to enhance and transform news consumption to a more personalized experience. The continuous connectivity and access to smartphones' sensors enable aspects of user's context to be incorporated into interaction with mobile apps. For example, Appazaar proposed by Bohmer et al. [38], generates app recommendations combining the actual app usage and user's current context. Similarly, Tavakolifard [54] leveraged users' location information to provide tailored news recommendation. Pessemier et al. [17] demonstrated the potential of a context-aware content-based recommendation engine which induces higher user satisfaction in the long run, and at the same time enables the recommender to overcome the cold-start problem and distinguish user preferences in various contextual situations.

Context in relation to news consumption has also been studied by analyzing social media behaviour. Social networking platforms such as Facebook and Twitter are becoming de facto distribution channels of news. Many apps leverage knowledge from users' social activities to recommend and deliver targeted news feed. Pulse, for example, developed by LinkedIn, is an example of one such app that delivers personalised news from a user's professional network. LumiNews [31], another example, leverages users' location, social feed, and their in-app actions to automatically infer their news interests. These, both implicit and explicit, signals were found to improve recommendations and improve user's satisfaction over time.

2.2   News Consumption and Adaptive News Interfaces

Data from Reuters [40] shows that the use of smartphones to view news media is rapidly growing, and is seen as the future for the news industry, especially with younger demographics [44] – a transformative change from times when mobile devices were thought of as "supplementary" to news-reading [58]. The Reuters report discusses 'gateways' through which news is discovered, such as search, social networks, and news-reading apps. It distinguishes between the different roles that Facebook and Twitter play in news consumption – initiated consumption vs. casual or play a central role in the discovery and presentation of content. However, while these platforms increasingly direct people to online news content and play a role in the spreading of 'fake news' (e.g., [33]), we still know little about the contextual factors that lead people to choose to consume that content in particular situations.

Previous work relating to contextually-aware news consumption technology has focused on appropriation of features and sensing technology within existing technological platforms. One of the uses for such appropriated data is the development of adaptive interfaces – systems that 'learn' user habits and use patterns, and adapt a user interface to better match those patterns [28]. Constantinides et al. [14,15] developed 'Habito News', an Android news app that presented participants with live news items while simultaneously logging frequency, time spent and location of reading, as well as speed and article completion rate using scroll-tracking. The goal of this research was to profile and classify reading habits into typical patterns of use, and to use those classifications as background to the

development of adaptive, context-dependent news-reading interfaces to match them. Other notable work in this area [4,54] has focused on customization of content, rather than adaptation of the interface through which it is presented.

The current study aims to understand the contextual factors relating to news consumption in order to understand if they might be classifiable in a way that could drive the adaptation of content or the interface on which it is read.

3   Method

In recent years, HCI researchers have used a variety of in-situ methods that were previously limited to psychology and social sciences to better understand user behaviour in general and context of use in particular. Some methods, such as ethnography, typically require a researcher to be present among participants in order to collect data [55], while others such as diary studies and experience sampling rely on self-reporting by participants. Diaries have been used in studies of information needs, with computerized [2,9,11,32] and non-computerized [12,18,43] apparatus. The experience sampling method (ESM) has been used to obtain in-situ information that is more real-time [9,10,13], and can be supplemented by interviews aided by memory cues based on participant responses [7,8,36,39].

A particular focus of self-reporting studies has been to lower the data entry and overall participation burden inherent in such studies, especially when entries are done under mobile conditions. Brandt et al. [6] proposed a 'snippet' technique in which participants chose an input modality that they were most comfortable with, and captured small pieces ('snippets') of information about their experience in-situ. These later served as cues for a more detailed web-based diary. Sohn et al. [52] used an adaptation of the technique, as did Church et al. [10], where the snippet technique was used in combination with experience sampling and a diary study to explore daily information needs.
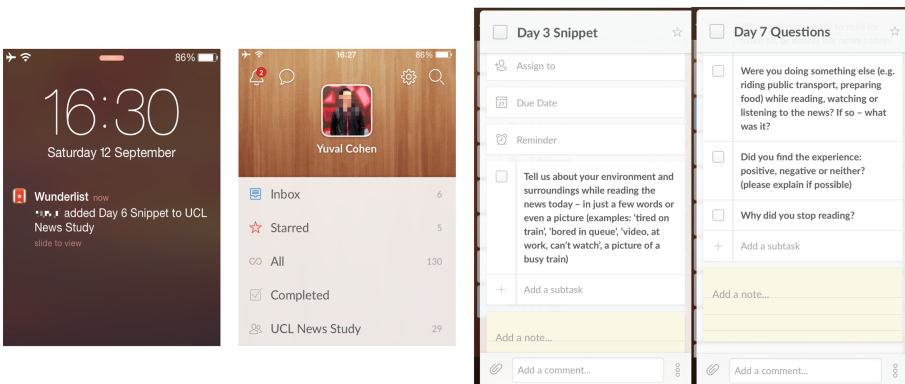

Fig. 1. Snippets and diary questions via the Wunderlist app

In the current study, snippets were used in combination with event-based ESM, triggered by participants' news reading. Participant responses to snippets were used as the basis for more detailed diary questions, and also served as memory cues during exit interviews. The user study consisted of three parts: (a) an instruction email; (b) snippet and diary questions; and (c) an exit interview.

A *Instruction email:* Participants received an email that included the study brief, installation and sign-up instructions for the Wunderlist app[1], and explanations on the types and timing of the questions that would be sent to them along with examples of how to answer the snippets, seeing as the snippets were designed to be more open and vague than the diary questions.

B *Snippets and Daily Questions:* Participants were sent two sets of questions every day through Wunderlist–snippets and diary questions, over a period of two weeks. Snippets were sent every morning, asking participants to add a short text or a picture of the context in which they consumed news that day. Sending times varied from one day to another, so as to minimize the potential cognitive bias associated with scheduled experience sampling alerts [13]. During the first 3–4 days of participation, instructions were given with examples (Fig. 1). In following days, the examples were removed. Four to five diary questions were sent every evening. Questions were limited in number so as not to impose too high a burden on participants, and were usually open ended so as to not limit the scope of responses. While questions varied in wording and order from one day to another, so they would not seem repetitive to participants, they were focused on four relatively distinct areas. Table 1 contains descriptions of these areas, as well as several examples for questions participants were asked about them. Initially, all participants received the same questions, which were modified from day to day in order to attain more detailed information about participant habits. However, as the goal of the study was exploratory and data analysis progressed throughout, the diary questions were customized for each participant on a daily basis.

C *Exit interviews:* Upon the 'snippets and diary questions' phase completion, participants were interviewed. Interviews were conducted either in person or via Skype, and were audio-recorded for later transcription and analysis. Each interview lasted between 20 to 30 min, and included three parts: (a) general and demographic data such as age and occupation; (b) targeted questions about the participant's responses during the situated study; and (c) questions about their experience regarding the data collection method.

3.1   Data Analysis

An iterative approach to data collection was taken, whereby collected snippets and diary responses were sampled on a daily basis and compared to concepts and insights that had begun to emerge. Interview audio was transcribed verbatim. Transcripts were then thematically analyzed [5]:

---

[1] https://www.wunderlist.com/.

Table 1. Diary question topics and examples

Question topic	Examples
Triggers for news-reading experiences	– What made you want to read (or listen to, or watch) the news today?
	– Why did you choose to read, watch or listen to the news at this specific time? (more than one answer is OK)
Environment and surroundings (e.g. concurrent activities, distractions, public or social settings)	– What did you like about your reading environment? What did you dislike?
	– Were you around others while reading? If yes – did this affect your reading in any way?
	– Did anything bother or distract you while reading? If so – what was it?
Feelings about news consumption experience as a whole	– Did you find the experience: positive, negative or neither? (please explain if possible)
	– Did reading the news affect your mood in any way? If yes – in what way?
Reasons for ending a news-reading experience	– Why did you stop reading?
	– What made you stop reading?

Open Coding: snippets, diaries and interviews were coded line-by-line using the NVivo qualitative data analysis software; pertinent statements were labelled.

Axial coding: relationships were identified between the concepts and categories that emerged during open coding. We sought to discern the phenomenon at hand (i.e. news consumption), with an additional emphasis on causal, contextual and intervening conditions, as these were the focus of the research, and would be the basis for later analysis. Analytic memos were used to note and highlight developing themes.

Themes were reviewed in a manner roughly corresponding to the six phases of thematic analysis set out by Braun and Clarke [5], though the process was recursive rather than linear, as noted by Braun and Clarke – we moved between phases as needed, repeating and re-evaluating themes and coded text as necessary.

3.2   Participants

Participants were recruited through personal contacts, social network posts, and notice-board adverts at three university campuses. The advert included

information about remuneration, inclusion criteria and a link to an online sign-up form. The inclusion criteria required participants to live in the UK, be 18 years of age or above, use an iPhone or an Android based-smartphone (for purposes of compatibility with the data collection app), and read the news on a regular basis using a digital device, so that digital consumption habits could be gauged. The signup form asked respondents to enter contact and demographic information, and included several questions intended to confirm that participants meet the inclusion criteria. This information was also used to diversify the study sample in terms of age, gender and students vs. non-students. It was also used to gauge commute time. Each participant was remunerated with a small payment in cash or transfer upon completion of the study, and one larger value Amazon voucher was drawn between all participants.

Seventeen knowledge workers were recruited for the main user study (ten female). Participant ages ranged from 22 to 47 ($M = 30$, $SD = 8$). Fourteen participants lived in London, and three lived outside of it but commuted to the city on a daily basis. Eleven participants were students, and six were professionals.

3.3 Apparatus

The Wunderlist platform was used to implement the diary study and the 'snippet' technique/experience sampling components of the study. Wunderlist provides a basic tier of its platform and apps free of charge. Therefore, participants were not required to pay for downloading or using the app.

Participants installed the Wunderlist app on their mobile phone, where they would receive notifications of new snippets or diary questions, which they could tap in order to view and respond to each of these respective items. The app allows users to enter text in several fields: the 'task' fields adjacent to the task-completion checkboxes, a 'notes' area for freeform entry of text, and a comments thread. Users were not instructed where to answer, and were given the freedom to answer as they chose. On the researcher's side, participants were managed from Wunderlist's software for Mac, with each participant being added as a 'list' that was shared by the researcher with the participant. Both the researcher and the participant could freely add, edit and annotate items on the list.

4 Results

4.1 Triggers for Reading the News

Triggers were specific reasons described by participants for consuming news in a particular situation.

Break from Study or Work
A theme with nearly universal prevalence among participants was the use of news consumption as a break from a different activity that usually required a higher level of concentration. Reading, rather than listening or watching, was usually

cited as the way in which news was consumed. A very frequently discussed rationale for reading news during a break was that it is an activity that still requires engagement, but not at the level required by work or study.

"[...] it's sort of a quality break [...] switching to something that's relatively similar, the same kind of concentration is involved, but it's still different enough that it provides a rest from what I was working on." P2 - Interview

Many participants described reading the news as something that didn't need the same level of concentration as work, and therefore provided an opportunity to restore their ability to focus:

"If I'm really burnt out I won't absorb any of the news, but it gives me something to focus on that's not concentrated on writing or coding or any of the other things that I'm supposed to be doing... A few hours later I will be 'what did I read again?"' P3 – Interview

Furthermore, a number of participants mentioned the discrete nature of news content as being conducive to their subsequent resumption of work. For example, P2 (Interview) explained: *"[...] it also has a beginning and the end - when I finish reading an article I go back to work. I can obviously read another article, but that will extend it by only a little".*

Morning Habit

A majority of participants indicated that they consume news in bed or while preparing and eating breakfast. Participants described this behaviour as habitual, except in unforeseen circumstances such as lateness or being in a hurry. This morning habit is corroborated in a study conducted by Böhmer et al., which found news apps to be the most popular in the morning [37].

Two reasons were generally cited. The first is, to use the term given by several participants, 'wanting to know what's going on in the world':

"When I just wake up and I want to know what's going on in the world, so in the morning I always check it [...] it's a habit, because I wake up... I always wake up quite early, so I can take my time to start easily, have my breakfast, and while I have my breakfast I'll scroll down the news." P5 - Interview

The second reason for morning news consumption was procrastination. This was cited either together or apart from the need to be updated about the news.

"Maybe it's just that I don't want to start immediately with working, and I just need to ease myself into it" P2 - Interview

Notifications and Widgets

Notifications are small displays of text that appear on a computing device, usually a smartphone or a tablet, and alert the user to a certain occurrence or event. Widgets are slightly larger 'windows' of content, that usually show a string of informative text and an image or graphic; notifications are momentary and disappear within a few seconds while widgets permanently reside on the user's screen until they are removed. Both served as triggers for news consumption.

Participant responses indicated that they frequently decided whether to tap on a notification or widget to read a story in more depth. One indicated that this

decision depends on the type of story, and whether she is otherwise busy. At times she will be content with consuming a news item exclusively via a notification.

"The push notifications from the Guardian app keep me informed without my having to read the story (or do anything)." P11 - Snippet

This participant later explained in detail: *"[...] 'England won the Ashes'.. I don't actually need more information than that, for example [...] It's completely dependent on how interested I am in the story and also what I'm doing at the time [...] they pop up at any time during the day, and I don't always have the liberty to check it immediately, because I'm doing something else, and sometimes I forget what it was before I've come back."* P11 - Interview

Social Feed Skimming
Participants described a logic for news consumption via social media that is similar to the one they described for notifications and widgets – i.e. a triage of whether to explore an item further or not.

"I pick up a lot of stuff that I read through the news feed of my Facebook page, [...] I find that more convenient way of accessing it, because it's sort of summarized in the posts that appear in my news feed" P14 - Interview

"[I] scroll down and see if there's anything interesting [...] If you're interested then you'll click on it [...] If not then just on to the next one. So it's just a quick scan of things to see if something really interesting has happened" P14 - Interview

Waiting for People or Technology
People were often triggered to look at news items when waiting either for people or for processes to complete. This can be viewed news consumption filling 'dead times' [46] or consumption of news in 'interstices' [20].

"[...] you're waiting for a friend for like an hour or something [...] it becomes a bit tedious, because I know that I'm using this just to fill time, as opposed to when I'm actually interested in something to read. [...] sometimes I really enjoy it when I'm actually saying 'OK, I actually want to see what's going on today', but other times it's just because I don't have anything to do... It's just to check whatever is going on there" P8 - Interview

Another participant discussed the effect of anticipation while waiting for people more poignantly, but pointed out that he sees news reading as a more productive 'time-killing' exercise than playing a game.

"[...] it's really just killing time until something happens or until someone will meet me; It can be a bit frustrating, because if it's something that you are waiting for and you know it starts at a certain time, you can kind of judge what you will read, but if you're waiting for someone, it's frustrating - they'll arrive and you are halfway through reading something... Because I tend not to go back to things as well, I think it's not as much of a relaxing experience. It's more killing time in a more productive way than playing a game, which I do sometimes." P14 - Interview

Situations of waiting for a certain process or machine to finish were also noted. The difference here, as opposed to waiting for a person, is that participants could better gauge the beginning and end time of the waiting experience.

Media Multitasking
Participants indicated that they sometimes read news on a digital device as a secondary activity while consuming content in another medium, such as television, but not being fully engaged (cf. [48,49]). One participant noted this happens when he is watching a television show together with his partner, and is not particularly interested in its content. In such a scenario of split attention between different forms of media, he will continuously evaluate the perceived benefit from each source and compare between them, terming this process as an 'interest/engrossment trade-off'.

"I will definitely scan a bit between the two [...] I guess it depends on how engrossed I am in either; I guess if the movie [...] has a slow part, then I'll move back to the news, and if the news is really interesting, then I'll get engrossed in that and focused on that, and then once I'm done I'll look back up and say 'this is going on' in the movie [...] I'll go back and forth. So it's about the interest/engrossment trade-off between the two, which will make me go back and forth." P3 - Interview

4.2   Conducive Contextual Factors

We define conducive contextual factors as those that have a positive effect on participants' news consumption experiences. Participants generally described these factors as being associated with a more pleasurable experience, and being more receptive to richer and longer content.

Alertness and Mood
Many participants highlighted how their emotional or cognitive capabilities in a given context are reflected in their likelihood of consuming 'hard news' - topics such as war or government corruption, or 'soft news' - topics such as celebrity news or 'man bites dog' stories [34]. This 'suitability spectrum' of hard news vs. soft news to the affective state of a user is outlined in Fig. 2.

One participant stated that a low level of alertness greatly reduces her attention and receptiveness to content, even to the point of stop reading.

"[...] that's a big factor [being tired]. I know that if I start reading an article and I'm tired I feel like I'm just LOSING IT, I feel like nothing is coming into my brain.. Nothing is going in. So at that point I stop" P2 - Interview

Another participant stated that while she will sometimes read news before she goes to sleep at night, she does not want to read upsetting stories .

"I won't try to read anything too harrowing [before going to sleep], you know, we're talking just interesting stuff... I try not to read about ISIS before I go to bed" P12 - Interview

Another participant described the positive end of this spectrum in reference to reading a newspaper on Sunday.

"Sunday is like the one day where I [...] just relax in the morning, because I just have such a busy life [...] that's my treat for Sunday, to just be able to lie in bed with a cup of tea and read the papers [...] I will read something much more in-depth, and longer, because I have the luxury of the time." P11 - Interview

Low alertness
Negative affective state

High alertness
Positive affective state

Soft News
Shorter Items

Hard news
Longer items

Fig. 2. User state - news consumption spectrum.

Background Activity
The issue of the suitability of different kinds of background activities for news consumption was one that split participants. Some stated that background sounds are conducive for working. Others expressed ambivalence towards background sounds while reading. Additionally, several participants were distracted by background activity, though the types of factors that would cause this varied between participants.

"I'm actually used to it for my studies [...] having music in the background. It doesn't divert my attention, it only makes me know there's something playing in the background; I can't concentrate without it. So when I want to listen to music and read the news, I stay concentrated, it doesn't split my attention. I mean, it does split my attention, but I'm focused on the news, not on the music." P6 - Interview

Another participant indicated that the background environment will affect the type of media she will choose for news consumption.

"[...] when I'm just walking on the street, I cannot read something and concentrate, so I prefer to listen to the podcast." P1 - Interview

Other participants noted visual and physical aspects of background activity as most affecting their news consumption experience. Some suggested that visual distractions were more detrimental to concentration than auditory ones.

"There was a lot of movement in the room, which I caught from the corner of my eye, so that kind of broke my attention [...] It can be less distracting [auditory stimulations], you can get into a sort of 'zone', where you tune it out." P2 - Interview

Other participants noted crowding as a detrimental factor to reading on public transport. One noted that he perceives as a personal safety issue.

"If I'm standing somewhere super-crowded, I'm not going to grab my phone and read the news, like on the bus [...] same with the overground [train] during rush-hour. It can get packed and I'm not going to break out my phone [...] it's just uncomfortable to do so, and also someone can just grab it and walk away" P3 - Interview

Another participant noted privacy aspects of standing within a dense crowd on the train.

"I tend to see other people looking. You get the feeling like someone else is also watching what you're reading, and that's not really nice and makes me a bit uncomfortable." P7 - Interview

It should be noted that even with the consensus among participants as to the distracting effects of crowding, some participants viewed them as tolerable and were not willing to forego news-reading unless the situation was extreme.

"Sometimes it's hard to [...] it's too crowded to even get your phone out and have a look at it [...] it's loud and it's bumpy [...] you can't really focus on what you're looking at, but equally it's something to do while you're spending those 12 min or however long on the tube." P11 - Interview

4.3   Negative Contextual Factors

We define *negative* contextual factors as those that hampered participants' news consumption experience, possibly causing them to alter it in some way, such as changing to another device, but not to end it.

Connectivity
Lack of Internet connectivity was cited by participants as a factor that hampers news consumption. They discussed various responses to this type of situation.

While dedicated article-saving apps such as Pocket[2] have been developed for offline reading scenarios, a prevalent solution among study participants was to open multiple tabs in their mobile Internet browser - an item 'hoarding' of sorts, though one user did note his frustration at the lack of serendipitous discovery.

"Usually on the public transport, I open news sites in different tabs and I activate it. So I find that not very comfortable, because in fact, I need to check the link, it doesn't go through because there is no signal." P6 - Interview

Another participant noted the use of the 'offline mode' in the news app she uses on her phone. *"[...] the Guardian app actually works offline, you just can't get the pictures and there's certain content that you can't get, but you can actually get the stories, even if you haven't got a signal, which is amazing, and really good."* P11 - Interview

For several participants, switching to a print newspaper was the preferable option in a situation of no connectivity.

"[...] if I'm on the tube as well, I tend to pick up the free papers... I read the news that way, so there's not much point in me looking at the BBC website when I'm on the tube. And also, I can't get reception [...]" P11 - Interview

As noted, some participants preferred to avoid the news consumption experience altogether when not connected.

"If I'm in the tube, I cannot access the Internet, so I don't think I will do anything if I was on the tube." P1 - Interview

---

[2] https://getpocket.com/.

Suboptimal Smartphone Experience

There was a consensus among participants that news-reading on a phone, while unavoidable on many occasions, did not provide what they perceived to be the optimal experience. A prevalent reason cited for this is that the phone is not conducive to serendipitous discovery of additional content. One participant, noting that the reading experience itself was satisfactory, suggested that following links was more difficult on the phone.

"The actual reading experience is fine when you're reading an article that you want to read and it's just text [...] but I feel like it doesn't facilitate easy links into other similar things [...] You can kind of scroll down through the article and there are related items on certain websites, at the bottom. I think it's something to do with the screen size, that it just feels very claustrophobic [...] If there was something in there that you wanted to read more about, it's not as simple as opening another tab in your browser on your laptop, for example." P14 - Interview

Another commonly cited issue was that certain websites were not customized for viewing on the small screen of the phone. One participant noted this in regard to serendipitous discovery while reading another piece of news.

"[...] it's also frustrating when people haven't [...] translated things properly for mobile, which happens quite a lot, where text doesn't resize properly. All of that sort of stuff makes it less, you know, comfortable." P14 - Interview

It should be noted that this perception of inconvenience was not universal among participants. Several, particularly younger, participants stated that a smartphone is their preferred device to consume news. One noted that when having the choice between her phone and a larger device such as a laptop, she will still choose her phone.

"[...] for reading at home, it's not on the computer; Basically, I will use my mobile phone [...] while I'm using the computer and doing some professional work like typing some important stuff, if I want to have some leisure time, I will take my mobile phone and send some message to my friends and also look for some news on my mobile phone." P1 - Interview

Multitasking

Participants indicated that in certain situations, they will consume news while performing another concurrent task. Concurrent tasks varied in both type and location, but generally had the effect of splitting attention, thereby decreasing engagement and making a breakaway from news consumption more likely.

One participant noted the effect of a concurrent task on the type of content she will choose to consume.

"[...] if I'm reading on my phone [...] in between things and in a situation where something else is going on, reading as a way to pass the time [...] If it's a story that requires me to think, to process what's going on, what the page is telling me, then I can't really get into it that much." P2 - Interview

Another participant noted productivity as a driver for multitasking while consuming news, and reiterated the effect it has on the type of content consumed.

"[...] if I'm at home I tend to feel more comfortable reading or watching the news when I'm doing something else [...] I tend to feel like I'm being unproductive if I spend an extended period of time reading or watching the news, so I tend to do it when I take a break from something else or am actually engaged in doing something else, so I sometimes have the news channel on while I'm sort of tidying up, or doing something that doesn't require [...] intellectual focus [...]. When I'm consuming news while I'm doing something else, it tends to be smaller articles or news." P14 - Interview

The tentativeness of user engagement in news consumption was also noted in the context of multitasking. One participant noted, in the context of reading on public transport, that news will always be secondary in terms of cognitive effort. This directly relates to the utilitarian role he assigned to news consumption.

"I don't think that there are many news items I would completely block every-thing out and not quite notice there's something else happening, it's like [...] just a distraction half the time. If I'm going to catch up with the news, it's really not important." P17 - Interview

Together, these statements indicate that there are instances in which participants will knowingly and willingly enter a situation in which they are not devoting their full attention to the news consumption experience, but it is nevertheless viewed by them as an appropriate activity.

4.4 Barriers to Use

Barriers are factors that lead to a situation where a user who would otherwise consume news chooses not to. This includes while already consuming news and choosing to end the experience, or alternatively choosing not to consume news in a certain situation at all.

'Me Time'
Several participants described some instances of their travel time on public transport as one in which they do not want to engage in any form of news consumption, or even any other activity. They described these occurrences as opportunities for introspection, reflection on their own thoughts, and even relaxation. In this scenario, participants would avoid consuming any sort of media.

"[...] sometimes when you're walking and you're on public transport, you just want your mind to be clear." P9 - Interview

Another participant described this experience not only as a way to 'clear the mind', but also as an environment in which she is secluded from unwanted individuals or pieces of information, despite being on a populated train.

"Sometimes I'll just be 'this is me time' [...] no one can get me, I'm not going to fill my head with more information, there's enough going on around me, my head's spinning with stuff, I just can't put any more stuff in it, even if it's a distraction, I need to relax my mind, and the train, for me, is the only place I can actually do that." P12 - Interview

While 'me time' describes a positive affective state, it was stated by participants as a reason for not consuming news, therefore is classified as a barrier.

News Overload

Some participants described negative emotions triggered by cumulative or successive instances of what they perceived as bad news, i.e. stories of a negative nature. While all participants who described this chose to stop consuming news as a result, the differences between them were in the intensity of emotions. One participant was relatively vivid:

"there are days when [...] especially if there's been a barrage of [...] Bad news, recently... Sometime you just want to put your head in the sand and go 'I don't want to know today'." P11 - Interview

Another participant described a state of disinterest:

"most of the news I don't find very interesting, like who killed who this weekend or a famous person that died, you know, doing something stupid, I don't find that interesting." P17 - Interview

Kinetosis

Several participants noted the issue of dizziness, nausea and an uncomfortable physical feeling while using a digital device to read in a moving vehicle.

One participant noted that she resolves the issues by only reading books, using a customized app that rectifies the motion-induced unpleasantness. This could possibly indicate a desire to carry on with the reading experience despite the physical obstacle, finding solutions to manage the issue.

"If I'm on public transportation I'll read a book, I don't usually read news. [...] I have a tendency to get motion sickness, and reading a book... I have a particular app on my phone that makes it very easy to read books, whereas reading pretty much anything else is very. It gives me motion sickness." P4 - Interview

Another participant indicated that she will avoid reading while she is standing on the train, as the simultaneous balancing and reading actions cause dizziness and nausea, however this does not occur when she is seated.

"[...] if it's too crowded then I wouldn't have a place to sit, I will have to hang on to something like hold the rails or just try to balance myself, and I don't want to read while I'm doing that, and usually I get this dizziness when I'm trying to read while I'm balancing... So, I switch to music and I won't read while I'm standing." P7 - Interview

For another participant, the way to prevent dizziness is to eliminate reading altogether and listen to a podcast instead:

"If I was on the bus, if I read news or if I read anything, I will feel dizzy, so I prefer to listen to podcasts. Also, this applies to when I'm just walking on the street, I cannot read something and concentrate, so I prefer to listen to the podcast." P1 - Interview

5   Discussion

5.1   Main Results

The current study discovered a variety of contextual factors that play an important role in news consumption, mostly of a phenomenological nature [21] - relating less to informational and computational aspects of a given context, and

relating more to the social, cultural, affective and behavioural elements that comprise an individual's context of use.

The discovery of such contextual factors demonstrates the role of interpretation and sense-making processes on how users interact with technology, as well as the dynamic, momentary nature of user actions within a given context. This is especially noticeable in the fluid patterns of device use in relation to the space in which they are being used, such as participants' preference to read news on their phone at home or at work.

These findings, coupled with a news experience increasingly shaped by mobility, are important to the central finding of this paper–the creation of news consumption 'places' by users. Participants indicated that they appropriate different spaces and devices to create contexts and environments for news consumption that suit specific and dynamic momentary needs and affective states, often independently from physical location. These findings link to Harrison and Dourish's [27] discussion of the creation of place through situated meaning making.

5.2   Theoretical Implications

News Consumption Is Opportunistic: Situation Matters More Than Physical Location

To a considerable degree, the findings of our study demonstrate that users create their own meaningful contexts for news consumption, adapting and appropriating a wide range of situations. In many, participants saw elements such as background noise, lack of connectivity, waning alertness or an additional concurrent task not as barriers, but merely as detracting factors in an array of considerations that shaped their news consumption experience. In certain instances, factors such as suitability of news consumption to a specific situation took precedence over other detracting factors, suggesting an interplay between context, affective state, and consumption. In other cases, factors such as kinetosis (motion sickness) and the desire for 'me time' led to no news consumption or even technology use at all.

The findings show that the factors affecting participants' news consumption habits were not only numerous, but also changed within an experience as a perceived need to do so arose in ways that were situated [53]. In one example, participants indicated that they changed their actions in-situ as a result of both internal and external states. For example, participants indicated that when waiting for other people, they will continuously adapt the type of content they read in terms of topic and length, in order to suit the waiting time and level of concentration they predict they will have. Another example is in the case of media multitasking, where concurrent activities of watching television and reading the news encouraged a continuous in-situ reassessment of media consumption preferences, in what one participant described as an 'interest/engrossment trade-off'.

Consumption Characteristics Are Shaped by Momentary Needs and States – into Consumption 'niches'

Examined from a broad perspective, the results of this study indicate that momentary needs are a primary driver for news consumption. Participants generally viewed news consumption as a break or leisure activity, which they engaged in when they wanted to keep their mind busy, fill otherwise 'dead time' or in cases where news consumption is a daily or weekly ritual. Importantly, in some cases, such as daily or weekly rituals, the needs and context seemed to relate specifically to supporting the consumption of news content.

While contextual findings were segmented for presentation purposes, the interplay between the momentary needs that drove these factors was just as important. For example, a situation where news consumption was triggered by waiting for someone also included the distracting element of expectation. Participants indicated that this had an effect both on the type of news they consumed and on their level of concentration and immersion. It is this interplay that seemingly connects physical environment, affective state, and type of news being consumed.

A needs-based approach is an essential part of the assumption that users appropriate spaces for news consumption. In this appropriation process, users essentially match a momentary need with the availability of opportunity to realize that need, thereby creating their own unique news consumption 'places', or 'consumption niches'. Dimmick et al. [20] previously discussed the concept of 'niches' in terms of time and space interstices in which users 'fit' their news consumption, such as with their mobile devices while commuting, or on a desktop computer at work. By focusing on aspects of time and space, Dimmick perhaps addresses elements inherent in a view of context as something to be measured [20], rather than from the perspective of the individual experiencing it. Indeed, Dimmick concludes his paper by defining it as a call for further exploration into the intertwining of media consumption in mobile contexts and users daily lives. The results of the current study add to Dimmick's work by adding a phenomenological layer of context to the theory of niches in news consumption. The act of creating these 'consumption niches', and the needs that drive it, point to news consumption being an opportunistic activity.

5.3 Practical Implications

As this study was exploratory, its goal is to serve as a starting point for future exploration of the identified contextual factors. While today's sensing technology facilitates easy measurements of movement, lighting and latitude-longitude coordinates, elements such as user alertness, mood and distraction are not yet as easy to identify. However, significant advances are being made in classifying factors such as user mood [24,35,51] and boredom [47,49] from smartphone and wearable data, and it is likely that smartphones and wearable devices in the near future might be able to robustly detect users' affective state [29], which might have significant implications for the development of new kinds of context aware

news applications. For example, the affective state of an individual could be used as a proxy to whether they are receptive to content that is 'hard news', or whether they will be more open to 'soft news'. In other words, a classifier could predict the 'user-alertness' based on user's emotional state, mobility patterns, or any other passive data.

Additionally, our work could expand the possibilities of previous adaptive content models such as the one proposed by Billsus and Pazzani [4] and Tavako-lifard et al. [54]. Just as importantly, it can expand upon the work started by Constantinides et al. [14–16] by adding to the range of factors by which adaptive interfaces match a user's habits, preferences and affective state. For example, factors such as the 'morning habit', the 'break from work or study', the 'media multitasking', the 'connectivity', and the 'suboptimal smartphone experience' could be easily identified from smartphones' sensors. In turn, the raw sensors signals could be translated into features to train models to detect these high-level factors. Having such models will be of particular use, for example, in the multitude of instances where contextual factors affected the length of text that users would read. For example, more concise descriptions of news content could be presented when users are more tired or distracted.

5.4   Limitations

The current study is subject to several limitations in the design and the results of the study. First, some of the methods used in the study carry the potential for certain biases. Diaries, being a reflective and self-reported method, have the potential for retrospective distortions [59]. Similarly, interviews are subject to recall errors, seeing as they are retrospective conducted even longer after participants' actions have taken place. However, the use of memory cues during interviews [42] and scheduling of the interviews as closely to the in-situ study as possible [50] were designed to alleviate this. An additional memory-related limitation pertains to the subset of users who, on several occasions, 'aggregated' snippets and diary questions and answered them all at once. While not rendering the collected data unusable by any means, this behaviour effectively negates the 'real-time' qualities of ESM and the value of snippets as memory cues, leaving the data as a traditional diary study. Similarly, there were also occurrences of participants responding to snippets, diary questions or both on the following day after they were sent. Seeing as uncued memory lasts for about one day [50], this behaviour might introduce some additional retrospective distortions, though supposedly not substantial ones. Finally, while the sample of 17 participants for this study is relatively standard for self-reporting studies such as diary studies and experience sampling, it would be ideal to further explore and gauge the effectiveness of the methodology presented in this paper, both for situated studies as a whole, and for news consumption and media studies in particular.

6   Conclusion

This study aimed to discover contextual factors that are of a qualitative nature, and that are currently not addressed by 'contextually-aware' research and software frameworks. The study produced findings that indicated a range of social, cultural and individual factors that drive the manner in which users consume news, and contextual factors. Most notably, the findings indicated that individuals often construct a context of use that is partially or wholly independent of the space in which their interaction with technology is taking place, reinforces earlier work by into the appropriation of spaces [27]. Participation rates and statements indicated a low participation burden, true to the original study design goal.

These results can be of use to the wider HCI community by serving as a starting point for further research into the phenomenological aspects of context, and enabling the development of news and media consumption technologies that will address these contextual factors, such as previous work into adaptive news interfaces [14]. Additionally, this research may herald further work into the design of in-situ methods that lower participant data-entry burden, as well as the appropriation of 'off the shelf' software applications for the purpose of in-situ research.

References

1. Abowd, G.D., Dey, A.K., Brown, P.J., Davies, N., Smith, M., Steggles, P.: Towards a better understanding of context and context-awareness. In: Gellersen, H.-W. (ed.) HUC 1999. LNCS, vol. 1707, pp. 304–307. Springer, Heidelberg (1999). https://doi.org/10.1007/3-540-48157-5_29

2. Amin, A., Townsend, S., van Ossenbruggen, J., Hardman, L.: Fancy a drink in canary wharf?: a user study on location-based mobile search. In: Gross, T., et al. (eds.) INTERACT 2009. LNCS, vol. 5726, pp. 736–749. Springer, Heidelberg (2009). https://doi.org/10.1007/978-3-642-03655-2_80

3. Augé, M.: Non-Places: Introduction to an Anthropology of Supermodernity. Verso, London (1995)

4. Billsus, D., Pazzani, M.J.: Adaptive news access. In: Brusilovsky, P., Kobsa, A., Nejdl, W. (eds.) The Adaptive Web. LNCS, vol. 4321, pp. 550–570. Springer, Heidelberg (2007). https://doi.org/10.1007/978-3-540-72079-9_18

5. Braun, V., Clarke, V.: Using thematic analysis in psychology. Qual. Res. Psychol. **3**(2), 77–101 (2006)

6. Brandt, J., Weiss, N., Klemmer, S.R.: Lowering the burden for diary studies under mobile conditions. In: Extended Abstracts on Human Factors in Computing Systems (CHI 2007), pp. 2303–2308 (2007)

7. Brown, B.A.T., Sellen, A.J., O'Hara, K.P.: A diary study of information capture in working life. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI 2000), pp. 438–445 (2000). https://doi.org/10.1145/332040.332472

8. Carter, S., Mankoff, J.: When participants do the capturing: the role of media in diary studies. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI 2005), pp. 899–908 (2005). https://doi.org/10.1145/1054972.1055098

9. Carter, S., Mankoff, J., Heer, J.: Momento: support for situated Ubicomp experimentation. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI 2007), pp. 125–134 (2007). https://doi.org/10.1145/1240624.1240644

10. Church, K., Cherubini, M., Oliver, N.: A large-scale study of daily information needs captured in situ. ACM Trans. Comput.-Hum. Interact. (TOCHI) **21**(2), 10 (2014)

11. Church, K., Oliver, N.: Understanding mobile web and mobile search use in today's dynamic mobile landscape. In: Proceedings of the 13th International Conference on Human Computer Interaction with Mobile Devices and Services, pp. 67–76 (2011)

12. Church, K., Smyth, B.: Understanding the intent behind mobile information needs. In: Proceedings of the 14th International Conference on Intelligent User Interfaces (IUI 2009), pp. 247–256 (2009). https://doi.org/10.1145/1502650.1502686

13. Consolvo, S., Walker, M.: Using the experience sampling method to evaluate ubicomp applications. IEEE Pervasive Comput. **2**(2), 24–31 (2003)

14. Constantinides, M., Dowell, J., Johnson, D., Malacria, S.: Exploring mobile news reading interactions for news app personalisation. In: Proceedings of the 17th International Conference on Human-Computer Interaction with Mobile Devices & Services (MobileHCI 2015), pp. 457–462 (2015). https://doi.org/10.1145/2785830.2785860

15. Constantinides, M., Dowell, J.: A framework for interaction-driven user modeling of mobile news reading behaviour. In: Proceedings of the 26th Conference on User Modeling, Adaptation and Personalization, pp. 33–41. ACM (2018)

16. Constantinides, M.: Apps with habits: adaptive interfaces for news apps. In: Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems, pp. 191–194. ACM (2015)

17. De Pessemier, T., Courtois, C., Vanhecke, K., Van Damme, K., Martens, L., De Marez, L.: A user-centric evaluation of context-aware recommendations for a mobile news service. Multimed. Tools Appl. **75**(6), 3323–3351 (2016)

18. Dearman, D., Kellar, M., Truong, K.N.: An examination of daily information needs and sharing opportunities. In: Proceedings of the 2008 ACM Conference on Computer Supported Cooperative Work (CSCW 2008), pp. 679–688 (2008). https://doi.org/10.1145/1460563.1460668

19. Dey, A.K.: Understanding and using context. Pers. Ubiquit. Comput. **5**(1), 4–7 (2001)

20. Dimmick, J., Feaster, J.C., Hoplamazian, G.J.: News in the interstices: the niches of mobile media in space and time. New Media Soc. **13**(1), 23–39 (2011)

21. Dourish, P.: Seeking a foundation for context-aware computing. Hum.-Comput. Interact. **16**(2), 229–241 (2001)

22. Dourish, P.: What we talk about when we talk about context. Pers. Ubiquit. Comput. **8**(1), 19–30 (2004)

23. Dourish, P., Bell, G.: Divining a Digital Future: Mess and Mythology in Ubiquitous Computing. MIT Press, Cambridge (2011)

24. Gloor, P.A., Colladon, A.F., Grippa, F., Budner, P., Eirich, J.: Aristotle said "Happiness is a State of Activity"—predicting mood through body sensing with smartwatches. J. Syst. Sci. Syst. Eng. **27**(5), 586–612 (2018)

25. Goffman, E.: Behavior in Public Places: Notes on the Social Organization of Gatherings. Free Press of Glencoe, New York (1963)

26. Gottschalk, S., Salvaggio, M.: Stuck inside of mobile: ethnography in non-places. J. Contemp. Ethnogr. **44**(1), 3–33 (2015)

27. Harrison, S., Dourish, P.: Re-place-ing space: the roles of place and space in collaborative systems. In: Proceedings of the 1996 ACM Conference on Computer Supported Cooperative Work (CSCW 1996), pp. 67–76 (1996). https://doi.org/10.1145/240080.240193
28. Jameson, A.: Adaptive interfaces and agents. In: Human-Computer Interaction: Design Issues, Solutions, and Applications (2009)
29. Kanjo, E., Al-Husain, L., Chamberlain, A.: Emotions in context: examining pervasive affective sensing systems, applications, and analyses. Pers. Ubiquit. Comput. **19**(7), 1197–1212 (2015)
30. Karimi, M., Jannach, D., Jugovac, M.: News recommender systems-survey and roads ahead. Inf. Process. Manag. **54**(6), 1203–1227 (2018)
31. Kazai, G., Yusof, I., Clarke, D.: Personalised news and blog recommendations based on user location, Facebook and Twitter user profiling. In: Proceedings of the 39th International ACM SIGIR conference on Research and Development in Information Retrieval, pp. 1129–1132. ACM (2016)
32. Kellar, M., Watters, C., Shepherd, M.: A field study characterizing Web-based information-seeking tasks. J. Am. Soc. Inf. Sci. Technol. **58**(7), 999–1018 (2007)
33. Kucharski, A.: Post-truth: study epidemiology of fake news. Nature **540**(7634), 525 (2016)
34. Lehman-Wilzig, S.N., Seletzky, M.: Hard news, soft news, "general" news: the necessity and utility of an intermediate classification. Journalism **11**(1), 37–56 (2010)
35. LiKamWa, R., Liu, Y., Lane, N.D., Zhong, L.: Moodscope: building a mood sensor from smartphone usage patterns. In: Proceedings of the 11 Annual International Conference on Mobile Systems, Applications, and Services (MobiSys 2013), pp. 389–402 (2013). https://doi.org/10.1145/2462456.2483967
36. Mancini, C., Thomas, K., Rogers, Y., Price, B.: From spaces to places: emerging contexts in mobile privacy. In: Proceedings of the 11th international conference on Ubiquitous computing (Ubicomp 2009), pp. 1–10 (2009). https://doi.org/10.1145/1620545.1620547
37. Böhmer M., Hecht, B., Schöning, J., Krüger, A., Bauer, G.: Falling asleep with angry birds, Facebook and Kindle: a large scale study on mobile application usage. In: Proceedings of the 13th international conference on Human computer interaction with mobile devices and services (MobileHCI 2011), pp. 47–56 (2001). https://doi.org/10.1145/2037373.2037383
38. Böhmer, M., Bauer, G., Krüger, A.: Exploring the design space of context-aware recommender systems that suggest mobile applications. In: 2nd Workshop on Context-Aware Recommender Systems (2010)
39. Nagel, K.S., Hudson, J.M., Abowd, G.D.: Predictors of availability in home life context-mediated communication. In Proceedings of the 2004 ACM Conference on Computer Supported Cooperative Work (CSCW 2004), pp. 497–506. ACM (2004). https://doi.org/10.1145/1031607.1031689
40. Newman, N., Levy, D.: The Reuters Institute Digital News Report 2015: Tracking the Future of News. University of Oxford, Reuters Institute for the Study of Journalism (2015)
41. Nguyen, T.T., Hui, P.-M., Harper, F.M., Terveen, L., Konstan, J.A.: Exploring the filter bubble: the effect of using recommender systems on content diversity. In: Proceedings of the 23rd International Conference on World Wide Web (WWW 2014), pp. 677–686 (2014). https://doi.org/10.1145/2566486.2568012

42. Novick, D.G., Santaella, B., Cervantes, A., Andrade, C.: Short-term methodology for long-term usability. In Proceedings of the 30th ACM International Conference on Design of Communication (SIGDOC 2012), pp. 205–212 (2012). https://doi.org/10.1145/2379057.2379097

43. Nylander, S., Lundquist, T., Brännström, A., Karlson, B.: "It's just easier with the phone" – a diary study of internet access from cell phones. In: Tokuda, H., Beigl, M., Friday, A., Brush, A.J.B., Tobe, Y. (eds.) Pervasive 2009. LNCS, vol. 5538, pp. 354–371. Springer, Heidelberg (2009). https://doi.org/10.1007/978-3-642-01516-8_24

44. Ofcom. News consumption in the UK: 2014 report. Ofcom (2014)

45. Pariser, E.: The Filter Bubble: What the Internet is Hiding From You. Penguin, New York (2011)

46. Perry, M., O'Hara, K., Sellen, A., Brown, B., Harper, R.: Dealing with mobility: understanding access anytime, anywhere. ACM Trans. Comput.-Hum. Interact. (TOCHI) **8**(4), 323–347 (2001)

47. Pielot, M., Dingler, T., Pedro, J.S., Oliver, N.: When attention is not scarce-detecting boredom from mobile phone usage. In: Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp 2015), pp. 825–836 (2015). https://doi.org/10.1145/2750858.2804252

48. Rigby, J.M., Brumby, D.P., Gould, S.J.J., Cox, A.L.: Media multitasking at home: a video observation study of concurrent TV and mobile device usage. In: Proceedings of the 2017 ACM International Conference on Interactive Experiences for TV and Online Video, pp. 3–10. ACM (2017)

49. Rooksby, J., Smith, T.E., Morrison, A., Rost, M., Chalmers, M.: Configuring attention in the multiscreen living room. In: Boulus-Rødje, N., Ellingsen, G., Bratteteig, T., Aanestad, M., Bjørn, P. (eds.) ECSCW 2015: Proceedings of the 14th European Conference on Computer Supported Cooperative Work, 19–23 September 2015, Oslo, Norway, pp. 243–261. Springer, Cham (2015). https://doi.org/10.1007/978-3-319-20499-4_13

50. Russell, D.M., Chi, E.H.: Looking back: retrospective study methods for HCI. In: Olson, J.S., Kellogg, W.A. (eds.) Ways of Knowing in HCI, pp. 373–393. Springer, New York (2014). https://doi.org/10.1007/978-1-4939-0378-8_15

51. Servia-Rodríguez, S., Rachuri, K.K., Mascolo, C., Rentfrow, P.J., Lathia, N., Sandstrom, G.M.: Mobile sensing at the service of mental well-being: a large-scale longitudinal study. In: Proceedings of the 26th International Conference on World Wide Web, pp. 103–112. International World Wide Web Conferences Steering Committee (2017)

52. Sohn, T., Li, K.A., Griswold, W.G., Hollan, J.D.: A diary study of mobile information needs. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI 2008), pp. 433–442 (2008). https://doi.org/10.1145/1357054.1357125

53. Suchman, L.A.: Plans and Situated Actions: The Problem of Human-Machine Communication. Cambridge University Press, Cambridge (1987)

54. Tavakolifard, M., Gulla, J.A., Almeroth, K.C., Ingvaldesn, J.E., Nygreen, G., Berg, E.: Tailored news in the palm of your hand: a multi-perspective transparent approach to news recommendation. In: Proceedings of the 22nd International Conference on World Wide Web (WWW 2013 Companion), pp. 305–308 (2013). https://doi.org/10.1145/2487788.2487930

55. Taylor, A.S.: Ethnography in ubiquitous computing. In: Krumm, J. (ed.) Ubiquitous Computing Fundamentals, pp. 203–236. Chapman and Hall/CRC, Boca Raton (2009)

56. Urry, J.: Mobilities. Wiley, Oxford (2007)
57. Wang, W.-C.: Understanding user experience of news applications by Taxonomy of Experience (ToE). Behav. Inf. Technol. **36**(11), 1137–1147 (2017)
58. Westlund, O.: From mobile phone to mobile device: news consumption on the go. Can. J. Commun. **33**(3), 443 (2008)
59. Yarmey, D.A.: The Psychology of Eyewitness Testimony. FreePress, New York (1979)