Citizens' Perceived Information Responsibilities and Information Challenges During the COVID-19 Pandemic

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ABSTRACT

In crises, citizens show changes in their information behavior, which is mediated by trust in sources, personal relations, online and offline news outlets and information and communication technologies such as apps and social media. Through a repeated one-week survey with closed and open questions of German citizens during the beginning of the COVID-19 pandemic, this study examines citizens' perceptions of information responsibilities, their satisfaction with the fulfillment of these responsibilities and their wishes for improving the information flow. The study shows that the dynamism of the crisis and the federally varying strategies burden citizens who perceive an obligation to stay informed, but view agencies as responsible for making information readily available. The study contributes a deeper understanding of citizens' needs in crises and discusses implications for design of communication tools for dynamic situations that reduce information overload while fulfilling citizens' desire to stay informed.

CCS CONCEPTS

• **Human-centered computing → Empirical studies in HCI**.

KEYWORDS

crisis communication, COVID-19, agency communication, information overload

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1 INTRODUCTION

Information and communication technologies (ICT) are essential tools for sense-making, social interactions and information gathering in crises, including during the COVID-19 pandemic. Cultural values surrounding risk, community cohesion and trust in hierarchical structures in crises [2, 3, 29] have shown to influence the use of warning apps and Social Media (SM). With the COVID-19 pandemic being a protracted crisis, it is unclear whether it leads to similar information behavior as other crises or emergencies. At the same time, "the relatively concentrated media world has given way to a new ecology of diffuse information sources" [30] in which citizens are increasingly both senders and receivers of information, using SM and increasingly messenger apps [20] to share, receive and search for information in crises [13]. News agencies but also state agencies, decision-makers and experts are increasingly offering content online, through a variety of ICT, from websites, apps, SM platforms to specific crisis tools such as warning apps [28]. This diversity of information and sources can lead to information overload, which is likely to occur when people perceive a high need to stay informed [32] and which might foster news avoidance [23]. Yet, information overload is typically only investigated in the context of SM. Therefore, in this study we address the question *how citizens perceive the information availability in the COVID-19 pandemic*. We conducted a one-week study with 47 German participants consisting of daily open surveys, complemented by two questionnaires. After the introduction, we discuss the state of the art on crisis and COVID-19 communication. In section 3 we describe the survey, followed by the analysis (section 4), before we discuss the results and implications for design in section 5 and conclude in section 6.

2 RELATED WORK

Insights into the COVID-19 pandemic show the dynamics of news consumption: First announcements of infections in the USA lead to increased Google queries about COVID-19, followed by a decreasing trend back to baseline [5]. Germans informed themselves several times per day during the first wave through various sources, whereas such activity later decreased [37], despite perceiving the threat of COVID-19 to be very high [25]. A study of Flemish Android users found that during the first wave, mobile phone use duration increased by 15% [21]. Especially the use of mobile news apps and SM was spurred by and remained high after the first announcement of measures, whereas the use of mobile web browsing remained largely as before [21]. This indicates a persisting increase

of information strategies as opposed to less structures information seeking through web browsers and an increase in social outreach as soon as public measures were announced. Being affected by public measures changed information behavior more drastically than the first case of a pandemic-related death in the country [21].

Previous research shows the role of messengers and SM in crises: In Germany, 73% of citizens used either WhatsApp or Facebook during an emergency, while 25% had used YouTube as an information source [13]. While SM is often investigated for crisis communication [27], messengers are on the rise, with around 50% using WhatsApp and around 25% using Facebook Messenger for news consumption in some countries [20]. Still, legacy technologies are important during crises [10], with television being the preferred information source [31]. Yet, during public health crises, online sources such as websites and SM gain in importance compared to traditional media [24].

Online behavior in crises typically falls into one of six categories: Helping, being anxious, returning, supporting, mourning and exploiting [14]. Some research has focused on the role of peer-to-peer communication, revealing citizens as contributors to situational awareness and as self-organizing helpers [22, 27] and in a dual role of sender-receiver [33]. Models also show different communicative actions in crises, from information selection to information acquisition and information transmission in the process of problem-solving and such information behavior depends on the trust in the information sources [4, 12].

Other research has revealed that especially local emergency responders and actors perceived as acting with expertise and without a political agenda are particularly trusted in crises [2]. Due to this trust and the reliability of their information, communication from authorities to citizens, e.g. through warning apps is an important aspect of crisis informatics. However, a study shows that in Germany only 16,5% were using any warning app in 2019, despite high recognition of their relevance [16]. The national context and risk culture also has an impact on societies' behavior and risk related expectations in crises. Three specific ideal types of risk cultures have been identified: state-oriented, individual-oriented and fatalistic risk culture, which differ regarding trust in authorities and blaming [9]. Germany is regarded as a "state-oriented risk culture", characterized by a believe that disasters can be prevented by public authorities, who are highly trusted and responsible for citizens' safety [9]. The risk culture also affects SM in crises, with Germans more skeptical of citizen-generated content [29]. Previous findings suggest that for other crises high risk perception leads to an increased usage of warning apps, as well as compliance with their behavior recommendations [12], while other studies have found this effect to be low for COVID-19 [26] and depending more on the believe in effectiveness of precautions [8]. Investigating the relationship between trust in authorities and the use of SM and warning apps, [2] found that citizens perceived a responsibility to trust hierarchical orders and were likely to cooperate with authorities in crises despite possible individual distrust based on negative personal experiences with security agencies. Looking at the state of research, we can identify a lack of qualitative research that elicits citizens' perspectives and their information motivations during the COVID-19 pandemic, regarding all ICT artefacts. While qualitative and ethnographic research has investigated information needs, such as in reaction to disasters [14] and regarding specific artefacts such as warning apps and SM [2], it is currently unclear which information responsibilities are perceived by citizens and how this may affect information behavior, information overload and coping strategies. We therefore designed a study to answer the research questions:

RQ1: Which actors are perceived as responsible for citizens' being informed about COVID-19 related information and which are perceived as reliable sources?

RQ2: What are citizens' unaddressed information needs, their information wishes and implications for designing communication in the context of a dynamic pandemic?

3 METHOD: REPEATED ONE-WEEK SURVEY

Recruitment and Sample: The study was conducted via SoSci Survey from 14th-20th of April 2020, during the first wave of COVID-19 infections in Germany while many restrictions were in place, such as shop and school closures or social distancing. Due to the federally varying regulations, the study focuses on the federal state Hessen to ensure exposure to a similar context. Hessen is located in the center of Germany, features both rural areas and urban centers and is rather representative of (western) Germany in terms of size, population density, unemployment and income. Potential participants were selected by circulating the link to the study, offering a 20 Euro voucher for participation. After review of a selection questionnaire, demographic gaps were filled by recruiting in Facebook groups related to Hessen. The selection characteristics consisted of participants' age, gender, judgement of oneself belonging to a COVID-19 risk group and urbanization. Signing up required some level of computer literacy. Due to the focus on interactions between the digital and analogue realms, we consciously chose participants who would have some manner of online engagement and included diverse participants from different educational backgrounds, living with and without children in the household and with and without proximity to other persons considered at high risk regarding the pandemic (see online appendix Section 1 at https://github.com/HaunschildJ/HaunschildPauliReuter_GoodIT_Covid19InformationChallanges for respondent details). The survey started with N=47 participants (60% female, 40% male) and ended with N=24 on day 7, providing 133 instances of diary entries (72 on workdays, 61 on the weekend). A similar socio-economic distribution was maintained throughout the study.

Survey Design: Each day for one week participants were invited to an online survey according to their preferences via email, SMS or Telegram. The item and question design built on previous research on crisis communication and crisis informatics, while giving options for additional media types and artefacts and posing open questions to elicit the respondents' perspectives and experiences (see online Appendix Section 1 for an example question and the coding scheme). The quantitative questions either asked for the most accurate description or offered responses on a 5-point Likert scale. The survey consisted of a predominantly quantitative pre- and post-questionnaire (socio-demographics, risk and obligation perceptions) on days 1 and 7, whereas days 2, 3, 5 and 6 posed identical open questions concerning ICT use and information behavior and sources used that day, offering prompt questions to support

participants' ideas of aspects that they may describe (see Table 1). Additional questions explored information overflow and evaluations of information sources and kept the journaling interesting. Day 4 addressed misinformation is not discussed in this paper.

Coding: For coding and analysis, we used the R 4.0.0, package RQDA (version 0.3-1) for Qualitative Data Analysis. After a first round of independent open coding [34] by two researchers, we abductively constructed similar coding schemes [36]. Codes were derived from thorough reading of answers to open-ended questions in the first coding phase as well as from code categories informed by crisis communication theories. The artefacts and sources relevant for crisis communication were derived from communication theories and previous crisis informatics research on citizens' and agencies' use of SM in crises [13, 27]. The codes particularly describing information content, communication, challenges, and coping strategies emerged. With the coding system reaffirmed through comparison and discussion, seven participants were randomly selected and coded by two researchers to test intercoder reliability using Cohen's Kappa k. After a training round, we reached a very good value of k = 0.81 for intercoder reliability (k > .80; [1, 18]).

4 RESULTS

Motivations, Responsibilities and Trusted Actors: Protecting friends and family was the primary reason for staying informed, followed by knowing the current regulations, evaluating adequate personal behavior and being up to date with the Hessian and German situation. Less important were aspects related to political discussions, donating or volunteering and following social and economic developments. Participants felt responsible to comply with measures to reduce the risk of infecting themselves and others, in particular people at high risk, their family, but also to support health staff. In contrast, few felt responsible for sharing information which they received. Participants stated particularly that they wanted to be informed about current measures, which was often considered easy. In contrast, some participants saw primarily agencies as responsible; *"I continue to see the agencies as having an obligation to better communicate the ever-changing regulations. Communication must be better"* (P33). Such agency communication tool place mainly through TV or radio, and through often localized news from specific federal news channels and municipalities' websites. Many participants described frustration with the lack of direct agency information. *"Authorities should provide standardized information on rules via certified, simple channels. And this before any other media do it!!"* (P42), describing a channel similar to a state-run information app, even though this participant was using the local warning app HessenWARN. Warning apps were also criticized for being too slow in comparison to public news media: *"Since I had already read the news, I felt well informed and didn't read the information in the warning app"* (P4). Overall, the use of warning apps or agency messaging channels was low, while agency websites were often visited. Agency websites provided some information about regulation and recommendation to 83% of the participants, while only 30% indicated receiving any information through agency apps and messengers (see the online Appendix Section 2 for the figures). Press conferences by politicians were frequently mentioned and deliberately sought out by many respondents, including via live streams, leading to positive emotions; *"Today I feel very well informed, because today the press conference with Angela Merkel took place, which was broadcast and I watched it on TV"* (P25). Information from both agency channels (75% reliable or very reliable) and warning apps (44%) was deemed somewhat less reliable than TV or radio news. SM and private conversations through messengers were deemed less reliable (19% and 3% reliable or very reliable). In comparison to social media, messenger apps are often neglected, whereas around 20% of the respondents indicated that they had obtained much or the majority of the important information through messengers. Only 9% obtained much important information through agency channels and over 30% none (see Figure 1). Citizens-to-citizen communication provided the majority of information to only 13%, while only 4% received no information through word-of-mouth.

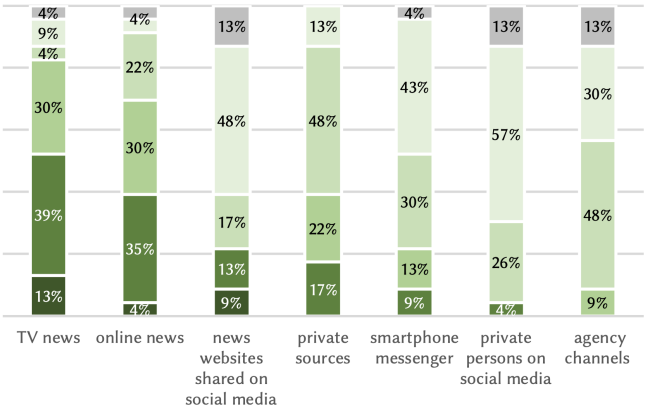

Figure 1: "How much important information about COVID-19 did you obtain through the circles/media/channels listed here?" (left to right: all, majority, a lot, some, none, not used/answered), N=23

Descriptions of helpful information included statistics, TV reports, local news through local radio and local news agencies' SM presences or municipal agency websites, expert podcasts and press conferences, while discussions and deliberation with friends were helpful for sense-making (e.g., *"With friends over Skype meetings we discussed how to evaluate the measures and how to deal with them"* (P42)). News apps were frequently mentioned, *"especially for a daily update and later to search for news about the new rules of the prime ministers"* (P1). They were often seen as successful filters that displayed news *"directly on the start page without me having to search for it"* (P4).

(Dis)satisfactions, Unaddressed Needs, Suggestions for Improvement: Some respondents reported challenges related to information overload; *"It always oscillates between a very large need for extensive information and a need to receive no news at all"* (P47). One person connected this overflow with digital media, blaming themselves: *"I am increasingly annoyed by digital media, as they provide too much information and steal a lot of time (but this is more my personal problem and less due to the inability of the media)"* (P35). Filtering and reduced media consumption were used as strategies for countering overload, e.g. *"I only watch/listen to serious*

Table 1: Survey Questions by Days (only questions that were included in the analysis, which also excludes questions of day 4)

Day(s)	Quantitative closed question; *qualitative open question*
Day 1	*What do you think is your primary obligation in this crisis? To whom do you feel obliged?*
Days 2-6	*What is your current experience* *… with personal or technical communication with friends, family and acquaintances regarding COVID-19?* *… with communication with larger groups (e.g. in messenger, in social media etc.) regarding COVID-19?* *… with communicating with authorities regarding COVID-19?* *… with experts regarding COVID-19?* *… with different information channels regarding COVID-19?* *What else do you have in mind about communication and distribution of information regarding COVID-19?*
Day 6	How do you perceive the information content on different channels, platforms or media? *How do you deal with information overload? How did you react to information overflow or doubts about the quality of the information? Did you adapt media consumption or your communication behavior?* *With regard to which aspects of the pandemic do you feel insufficiently or unreliably informed? How do you deal with the lack of information? Where do you look for it? Is there any information that you cannot find despite your research?*
Day 7	What have been your primary motivations for gathering information about the COVID-19 pandemic? What amount of information did you get from authorities such as the federal government, police, ministry of health on new COVID-19 measures, recommendations and laws through which channel? Which amount of agency information related to COVID-19 regulations and recommendations did you receive via these channels? How much important information about COVID-19 did you obtain through these circles/media/channels? *Was there any information and types of communication that particularly helped you to behave positively regarding the pandemic? If so, can you please describe it for us? What kind of information was that? Where did this information come from/In what circle and through what channels did you have this exchange?*

news (Tagesschau, heute, hr-info)" (P8). Many reported not reading app or push messages or taking breaks from information seeking, e.g., on the weekend or when the weather was good or avoiding channels such as Facebook that some perceived as toxic. One participant explained changes in media consumption, limiting themselves to watching the news and redirecting personal conversations to other topics. Fake news was often mentioned as a challenge, which was associated with SM and group chats, especially among family members. People associated this with unquestioned sharing of information and thus stated that they prefer not to share information: *"information is typically falsified by forwarding"* (P7), whereas one person took on the responsibility to correct false information as a moderator in a Facebook group. The participants were split on whether there was a lack of information. A large proportion of the sample felt that the information was sufficient (12 out of 32, e.g. *"I feel sufficiently informed about all aspects at the moment"* (P35)), while many missed a clear overview of regulations, e.g. *"We […] concluded that nobody knows exactly what is allowed and what is not. Everyone has heard something different or remembered something different"* (P7). This insecurity was often related to location-specific regulation and differences between federal states, particularly for people commuting between two states. Complaints regarded the lack of central information, e.g., the wearing of face masks: *"I had to search for the cities that interest me. I was annoyed that there is no overview [about what applies in which city] on the Hessian site"* (P41). This was an issue even for people who knew of agency channels: *"E.g., Katwarn is not used for its purpose. Looking for information oneself can be misleading. In this tense situation, this leads to even more confusion and speculation"* (P23). One of the dominant wishes was for a tool that gives a quick overview, also over different regulations in federal states and neighboring countries: *"It would be nice to have an official portal (e.g., app), where all important information is collected, and which points to other pages or articles"* (P7). Information should be centralized, coming *"[…] through ONE government platform. NOT through various different platforms of individual authorities, ministries, federal states etc."* (P42). Other participants had identified an agency channel, the Telegram COVID-19 channel of the Federal Ministry of Health, but perceived that it was not well-known. Another wish was for personalized information, such as regular reports about the own and neighboring municipality, as well as age-specific or profession-specific recommendations, e.g., for teachers. Typically, reasoning and debate about regulation was not expected, rather there were complaints about reporting *"about things that are still being decided [...] and thus confusing whether it is already in effect or only in planning"* (P6).

5 DISCUSSION AND IMPLICATIONS FOR DESIGN

In the participants' responses we can identify coping behavior, with participants limiting their information seeking at certain times, supporting findings that information overload leads to retreat not just on SM [23] but also in general. While community values such as protecting others were the driving forces for staying informed about current measures and adequate personal behavior, participants did not feel responsible for sharing information with others and even avoided it, fearing the spread of false information. This appears to

partly contradict findings in the US where participants intended to forwards trusted health information [7]). It may be explained by the German state-oriented risk culture, which implies that Germans are skeptical of user-generated content and of information shared through messaging channels [29]. The high level of trust in authorities, another aspect of state-oriented risk cultures, is further shown by very positive evaluations of press conferences and the wish for more structured agency information. At the same time, about half of the participants received no information through agency channels. Live tickers were mentioned in connection with information overload, while news apps were mainly positively described. However, many found it difficult to identify the outcomes amidst the debate that is shown in news apps. Warning apps, which can reduce information overload through regional settings, reliable information and updates of important information through push notifications [11, 28, 35], did not present themselves as adequate solutions, because they were slow and did not offer the information that was sought. However, since then the German warning app NINA has been extended to include local regulation related to COVID-19 [6]. Since information overload can be worsened by push notifications [32], users' preferences regarding immediate push notifications, regular updates and "pull" information in this context, which is neither an immediate emergency, nor everyday-life, should be further investigated.

Looking at information gaps, challenges relate to local, federal and sometimes national differences in regulation for specific topics. Specific COVID-19 information apps such as "CoroBuddy" and "DarfIchDas" are increasingly offering an overview of current regulations sorted by theme, such as face masks, travel, commerce or religious communities, partly offering the option to mark topics as favorites. All the information is offered on a "pull" basis, requiring users to look up changes, which are updated manually by the app providers. At this point, the apps primarily show federal regulation, neglecting local regulations, e.g. about childcare facilities. While the apps display incidence numbers of several locations, they do not allow an overview of differences, e.g. for commuters. Setting nuanced preferences to avoid information overload and achieve information satisfaction is another challenge that should be further investigated. Some messenger apps, which are wide-spread and relevant also in daily life, offer new options for news consumption through news bots [19] and increasing development options for bots [17] that could send updates on previously specified topics at specified times. Bots such as the "D64 Covidbot" (https://covidbot.d-64.org/) already exist, but they are currently limited to machine-readable and readily available statistical information.

In addition, reliability and receiving only up-to-date information was a challenge. It should thus be investigated how this affects the COVID-19 information apps, where the state-run app NINA, the pro bono app DarfIchDas and the volunteered app CoroBuddy may be compared. When involving local authorities, it should also be investigated how the back-end may be designed to enable and support authorities in entering locally specific information. Natural language processing and machine learning, which is already investigated for news bots [15], could be used to process laws and regulations and support agencies in providing the information.

6 CONCLUSION AND LIMITATIONS

Through a qualitative repeated survey this study investigated how German citizens perceive and evaluate their own and agencies' information responsibility in the COVID-19 pandemic. Previous studies indicate that cultural values, including trust in agencies and community cohesion, influence information behavior in crises [2, 3]. At the same time, information demands change in crises, during the COVID-19 pandemic particularly around times when new measures are announced [21]. The perceived need to stay informed for daily life has, however, also been found to increase information overload, which is worsened by certain ICT [32]. The key findings of this study are that

- Germans perceive themselves as responsible and motivated to stay informed in order to behave adequately and protect their family and friends;
- they do not feel responsible for sharing information with others;
- citizens perceived a shared information responsibilities with agencies, who were regarded as responsible for preparing information in a concise manner;
- they perceived information seeking as strenuous, indicating information overload and as a consequence consciously limited their news consumption or use of specific tools;
- they were skeptical towards social media, perceived news media as very reliable, and used press conferences to decrease insecurity;
- a large group who found it difficult to identify the outcomes and current measures for personally relevant topics and regions;
- a gap exists for ICT that portray reliable, fast information that depicts personally relevant local, federal and to a smaller degree national differences in regulation.

As changing risks and regulations are highly relevant to daily life, attaining this information appears to be particularly stressful and prone to causing information overload [32]. We therefore suggest more research on tools that cover the space of dynamically changing regulation that do not qualify as emergencies - and may therefore not warrant warnings in crisis apps -, but that require the cooperation of citizens, can have severe consequences for them and vary locally and nationally. An information tool could be helpful to achieve this, which should consider demands that citizens express in the context of warning apps [11, 16, 35], which similarly provide information in crises, e.g. for highly relevant information as push notifications. Providing information, a feeling of "being well-informed" while reducing information overload is an open challenge in the protracted and dynamic crisis. As agencies were regarded as both co-responsible and reliable, but their channels were not widely used, their potential role in providing accessible overviews of up-to-date local regulations should be explored more. Participants were selected to cover the broad Hessian population, which also reflects the different characteristics of the German population. While the study is limited by a small, non-representative sample, due to its qualitative nature, it has revealed information challenges and needs for dynamically and locally varying crises that are likely shared by many. These challenges that are likely also relevant in other dynamic situations with changing regulation.

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