

# Moving Towards User-Centered Government: Community Information Needs and Practices of Families

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## ABSTRACT

Government organizations have begun to consider how to provide families with information about their communities, yet their current design strategies focus on providing any and all of their information. This makes it difficult for families to find what is relevant to them. To help address this problem, we conducted a diary and interview study to explore what community information families are actually interested in, how and when they acquire it, and what challenges they face in doing so. Results show that location-based information in their environments triggered people to want to know more about their community while time-based information helped people plan family activities. Family members also wanted to have information resurface at particular places and points in time to support face-to-face interactions. Our analysis suggests design opportunities to leverage the affordances of print and online media and the use of in-home technologies to support the interactions between family members. We also suggest considerations for location-based experiences within communities.

**Keywords:** Community, e-government, families, urban informatics.

**Index Terms:** H.5.2 User Interfaces: User-centered design; H.5.3 Group and Organization Interfaces: Collaborative computing

## 1 INTRODUCTION

Family life is frequently concerned with awareness of the happenings and activities within one's community and environment [29]. For example, parents are often interested in knowing about the leisure activities available in their community for their children to participate in [29]. Adults may also want to know about upcoming municipal elections or developmental proposals for new buildings or shopping centres. There are a large number of digital and non-digital technologies that present this information to families. This includes newspapers, the radio, and television, along with social media, blogs, and government websites. We also see new and interesting design solutions such as Nextdoor [27] and the Blacksburg Electronic Village [6].

Government organizations at municipal, provincial or state, and federal levels have also begun to consider how digital technology can provide a communication channel in which people can connect with their government agencies [1][11][16]. Such agencies are also looking at digital tools that will encourage people to participate and maintain a sense of interest within their communities, whether it is via their websites, traditional news media, social media tools, or mobile applications [15]. However, the challenge is that many government agencies take a 'more is better' approach and post any and all information within their online sites [1][5]. This makes it difficult for people to find relevant information [1][4][5]. As a result, it is important to understand what information needs people *really* have, and where and when they would use this information [4][5][11].

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Our overall research goal was to understand what types of *local community information* and services families want or need to know about and how this information should be presented to them. By 'local', we refer to the cities in which one lives or visits as a part of everyday domestic life. By 'community information', we refer to information such as bylaw documentation, community or municipal events, elections, traffic, construction, etc. While described here, we were largely interested in having participants define this type of information as part of our study. Specifically, we wanted to explore when, where, how, and why such information or services were sought out and what challenges people faced in acquiring and sharing this information. We wanted to use this information to understand how government websites and portals—be it for computers or mobile devices—could better present relevant information to families. We chose families with children as a focal demographic since they are often involved in a large amount of community-based activities, such as sports, school, and leisure activities [29].

To explore this design space, we conducted a diary and interview study with eighteen participants. Our results revealed two main types of community information that people were interested in or needed to know about: *location-based information*—knowledge tied to specific places—and *time-based information*—knowledge of upcoming events and happenings. The former was used throughout daily life to understand one's community and how it was changing (where people often did not even realize they were interested in the information before they saw it). The latter was used to plan family activities within one's community. People routinely used curated information sources (both tangible and digital) to discover this information (*if* they were even able to discover it). People also often waited for information to come to them, rather than to seek it out.

Overall, these findings illustrate a stark contrast between the ways families actually wanted to acquire community information and the way it is presented by government organizations online. Our implication suggests that systems should be designed to support information sharing amongst family members where information is surfaced both 'in-the-moment' and at later points in time for family discussion. We also highlight how some information needs to be presented within the context of the home to support discussion and decision making, while other information is most relevant when received *in situ* outside the home.

We first outline related work on current sources of community information and domestic communication. Second, we describe our study methodology. Third, we outline our results and then conclude with a discussion of our findings and what they mean for the design of digital technologies to connect families with their government, community, and related information.

## 2 RELATED WORK

### 2.1 Government Websites and Social Media

Community information is available through multiple channels, including government websites, local newspapers, social media networks, television, and radio news broadcasts. Despite the wealth of

community information available on city websites, such sites are often underutilized [5][15][31]. Often poorly designed, city websites contain an overwhelming amount of information that is difficult to navigate and often out of date [1][5][31]. Though people wish to engage with the city by reporting real-time incidents, such as traffic, road potholes, or graffiti, they often do not have the channels to do so [16][18][19][24]. Yet research has suggested that a well-designed mobile system can serve as a link between government information and community engagement as it provides immediate access for people to retrieve, capture and share information [14][16][18]. Ganoë et al. [18] and Kim and Kleinschmit [24] suggest that such participatory channels can support engagement by community members while encouraging the use of digital government services. Our work builds on these perspectives to explore how family members currently access and use community and government information, both at home and on a mobile device.

In addition to government websites, people also turn to social media (e.g., Facebook, Twitter, etc.) to maintain an awareness of community activities (e.g., traffic, community events, or upcoming housing developments), to share their views, and to interact with their community [22][23]. While studies have shown that social media usage can support opportunities for government-citizen interactions, many cities have limited their active participation with social media due to corporate policies, concerns about the privacy of citizen information and security of government information [22][23]. As a result, people who are accustomed to timely and interactive dialogue afforded through social media tools are choosing other channels of communication. Instead, people are turning to smaller networks, such as Nextdoor [27] and the Blacksburg Electronic Village [6] to interact with others within their local community.

## 2.2 Urban Informatics and Community Displays

Urban informatics is defined as the intersection of people, places, and technologies within cities [14]. Foth et al.'s [15] research explores how to design mobile technologies with consideration to the value of play, culture, and lived experience, rather than solely designing from the perspective of efficiency and productivity. Several mobile systems have been designed to encourage playful civic engagement and communication with government organizations [15][16]. The *Fix-o-Gram* program was a collaboration between Foth's research group and their local government authority to enable residents to submit photos of issues to be fixed to the city [16]. *CityFlocks* offered residents the ability to stay informed and to learn about their city by accessing local residents' comments about different places within the city [2]. Our study explores how urban informatics systems can be designed for families with consideration of their common uses of web-based and mobile technologies, including bulletin boards, email, text, and instant messaging. Our research goal more deeply explores how technologies can be designed to allow family members to better foster their relationships with each other, as well as explore the communities in which they live.

Research has also shown a slow shift towards digital public displays to facilitate content sharing and interactions with information, places, and people within communities [17][35][36]. Such displays can aggregate social media content and facilitate the sharing of information with collocated people [36]. As community displays continue to increase in popularity, it is likely that public displays will shift from non-interactive to interactive content [17]. We turn our focus to understanding how large displays can facilitate and support a sense of community, but within the context of domestic life. While mobile phones can strengthen pre-existing social ties (e.g. friends and families) [35],

community boards support interactions and information sharing amongst strangers within a space. Our research seeks to explore how content created by a "stranger" (e.g. local newspapers, government websites, social media posts) can be presented and consumed by family members. We also investigate the types of information families are interested in and how they currently stay up to date on such information.

## 2.3 Family Communication and Location-Based Tools

There exists a body of research in domestic computing which has explored how to design technologies within the existing routines of a home. Traditional, tangible artefacts, such as address books, calendars, letters, bills, and newspapers are routine components of family life [28][39]. Kitchen counters, bulletin boards, and drawers often become the centralized places to store such material [28][39]. Sellen and Harper [37] discuss the affordances of these physical objects, such as the ability to hold, carry, and write on them as needed. Understanding the common practices of how families interact and manage print-based media has enabled researchers to design technologies that support such affordances, while introducing new ways to digitally store and share information with distributed family members [11][28][30][39].

One portion of our study results point to the technology routines of people when they are mobile and the design of location-based tools. Prior research has pointed to similar, yet complementary ideas. For example, Teevan et al. [41] explored the importance of location, time, and people when conducting mobile searches. Findings from their survey of 929 mobile users revealed that such searches were highly influenced by geographic location, where 40% of users searched for information within the vicinity of their current location and 68% were in transit and wanted information related to their destination [41]. Church et al. [7] studied search behaviour on mobile devices and found that individuals behaved differently when using a service in varied locations, times, or circumstances [7]. Overall, these studies reveal the need to provide location-based information to people depending on their context. Our work explores what this means for community-based information related to government and municipal services.

Research in the field of mobile technologies also explored the capture and presentation of location-based information for families [21][31][34]. For example, the *Whereabouts Clock* was a location-based application that supported awareness of family members' current locations to contribute to a sense of identity as a family [3]. More closely related to the design suggestions from our study, *Place-Its* provided location-based reminders for family members as they moved to various places throughout their day [38]. This often related to one's personal tasks such as 'buying milk' at the grocery store, rather than information *about* one's community. *GEMS* allowed users to store location-based stories about one's community for future generations to receive *in situ* [33]. The focus was on personal stories and not services or general knowledge about one's community [33]. Studies of these systems [3][33][38] revealed that location-based reminders are useful, wherein location often provided indirect cues for other information.

As can be seen, prior studies have extensively explored the communication routines and behaviours amongst family members and the general types of information families interact with throughout everyday life. Our study narrows down the focus to understand how families interact with community information more specifically where we aim to inform future design work.

## 3 STUDY METHODOLOGY

We conducted a diary and interview study to understand how, when and where families find information about their *local*

community, which tools families prefer to use to manage and share such information (including whether they use government sites and resources), and the challenges they face in acquiring, acting upon, and sharing this information.

### 3.1 Participants

We recruited eighteen people (ten female) through snowball sampling, word-of-mouth, and by posting ads on an online classified advertisements forum, Craigslist. The median age of participants was 42; ages were spread across the following age groups: 30 to 39 (six), 40 to 49 (seven), and 50 to 59 (five). All participants resided within multiple suburbs of a large, metropolitan area in Canada. Participants were all fluent in English and frequent users of technology, including desktop computers and mobile smartphones. We were specifically interested in families where one or more adults had full-time jobs and who were primarily responsible for a household and coordinating their children's schedules with recreational activities (15 of 18 participants had children whose ages ranged from 8 months to 27 years old). As such, our participants had diverse full-time professions, including work as stay-at-home parents and employment in the public sector, technology and sales industries. Participants were each entered into a draw for one of four gift cards (valued at \$50 each) as compensation for their participation in our study.

Participants completed an online survey that gathered basic demographic information, such as age, gender, education, and profession. Survey questions also explored participants' current living situation (e.g., homeowner, home renter, shared accommodations, etc.) and how connected participants were with their community. We asked participants to briefly describe what types of community information they were most interested in knowing and how they currently sourced such information.

### 3.2 Three-Week Diary Study

Over a period of three weeks, participants were asked to maintain an online diary about any points of interest within their environment, whether it was in the form of physical objects, places, billboards, public notices, or any socially-related interests, such as instances of homelessness, vandalism, or crime. Participants were also able to record their thoughts as it related to any ideas or concerns surrounding their community, thoughts on becoming involved and interacting with others, or searching for information online about their city.

Participants were set up with a private Twitter account that we asked them to use to record their thoughts using any form of post (text, links, photos, videos, or re-tweets). We expected that allowing multi-media formats within the diary method would enable us to understand both the actual point of interest and the surrounding environment; e.g., a person could post a picture of the location containing the information that they were interested in.

We chose the above experience sampling method [8][20] in order to reduce the need for participants to recall their practices; instead, participants were able to capture their current activities, thoughts, and feelings in-the-moment with their mobile phone while they were amidst their normal daily activities. Twitter was chosen as our data collection tool as it offered privacy settings (where only we, the researchers, could view their posts), location-tagging, photo, and video abilities. This gave participants a variety of capturing and recording options. Twitter was also available for multiple platforms (e.g., Android, iPhone, BlackBerry, Windows).

We asked participants to post a minimum of four weekly posts (> 1 per week), though more frequent posts were encouraged. We sent a weekly reminder email to encourage participants to continue posting throughout the week.

### 3.3 Semi-Structured Interviews

Following the diary period, we conducted a semi-structured interview (that lasted between 30 and 60 minutes) with each participant individually in-person or over Skype. Interview questions explored participants' daily routines and interactions with their local community. For example, questions included, "Describe your commute to and from work", "Describe how you currently use your city's website, if at all", and "Tell me about the last time you shared community information with a family member". Questions also sought to understand participants' community interests by reviewing their posts from their diary and asking them to further elaborate more about their thoughts at that time. This process helped us understand what it was they were specifically interested in and why they were interested in that particular aspect of their community. We also asked participants how they retrieved such information, and how they managed and shared such information with their social network.

### 3.4 Data Collection and Analysis

All interviews were audio-recorded and transcribed. We also kept typed notes for all interviews and downloaded all online entries from each participant's private study Twitter account. Using open, axial, and selective coding, we completed a thematic analysis on the survey, diary, and interview data. We also analysed a total of 293 textual posts and 67 photo posts captured during the diary stage (the range of posts was between 9 and 80; median number of posts was 32, and 5 for photo posts). Overall, we uncovered several themes that illustrate people's community information needs and routines for accessing such information.

Our results first discuss the general themes we drew from our participants' online diaries, including what types of community information they were interested in and their sources of such information. We then discuss how they retrieved such information and the interesting attributes surrounding these routines.

## 4 COMMUNITY INFORMATION NEEDS

Participants' posts included a combination of photos, re-tweets, and textual descriptions. Within the diary posts, we found seven themes that formed the following categories of community information people recorded as being of interest to them: administrative, maintenance, recreational, legal, traffic, community, and environment.

We defined a post to be 'administrative' when it related to the more task-related act of paying bills, property taxes, or applying for licenses and permits. A 'maintenance' post surrounded thoughts or ideas requiring services from local government, such as garbage collection, roads maintenance (e.g., construction, potholes), and parks maintenance (e.g., cleanliness). 'Recreational' posts involved activities in parks, trails, or community centres. Posts about noise bylaws and building permits were categorized as 'legal'. 'Traffic' posts surrounded thoughts on traffic conditions and regulations. 'Community' posts were any inquiries surrounding events in the area or ways to become involved with others on a specific initiative. Finally, 'environment' posts were related to any developments within the community (including rezoning applications), and sustainability practices. At a surface level, the diary posts demonstrate thoughts about general community information during participants' daily activities.

When acquiring information from these different categories, we found that participants would often perform direct web searches for specific information that they wanted to know about. For example, if they wanted to know how to purchase a dog license or register for skating lessons, they would turn to a popular search engine. This was because searching was thought to be easier than

navigating through layers of information of a website. For this very reason, we found that they very rarely looked at their local government's website to find information and relied on their preferred search engine or physical print brochures or newspapers.

Yet beyond this basic pattern of information acquisition, a deeper analysis revealed interesting additional routines around how people gathered community information, when and why people thought about this information, and how such information was shared with family members or friends. We now detail each of these practices.

## 5 LOCATION-BASED INFORMATION

First, we found there was a large amount of *location-based information* that participants wanted to know about within their community and local surroundings, yet they often did not know about this until they saw something that piqued their interest. We refer to it as location-based information because it was tied to specific places in one's neighbourhood or city. A common type of location-based information that surfaced across many of our participants was thoughts surrounding *traffic* and road construction (*maintenance*) within their community. Participants expressed frustration with encountering road closures, construction zones, and traffic during their commute. Other types of location-based information included knowledge about services offered by local government, such as garbage collection (*administrative*), concerns with park services or facilities (*community, environment*), and items related to bylaws (*legal*).

For example, P3 included a post in his diary about seeing construction occurring at a busy intersection on his commute to work, but did not know much more than what was indicated on the sign.

*"whatsgoingon@ NE corner of [street 1 and street 2]? They're building smething, be nice if they posted sketch pic of what we have to look forward to!" – Tweet by P3, Age 42*

He explained that he was curious about the development as it looked to be a large-scale project that would span multiple years. He wanted to know more about the impacts of the construction and traffic. Other participants reported similar interests as P3, with a large number triggered by signs or sightings while driving or walking. Thus, rather than learning about local happenings on websites or social media, our participants told us that they were often made aware of upcoming city developments within their environments only after passing by and seeing a large billboard.

This location-based information often triggered people to do more in their neighbourhood or learn more about a situation. For example, P8 described seeing a physical notice at his neighbourhood park he routinely visited that identified the date of the last car break-in. This cued him to remember to lock up his own car and hide any valuable items.

In other situations, participants talked about wanting to find out more information related to what they saw in their community. For example, P7 would routinely walk her dog in various parks throughout her city. One day she encountered a development sign (Figure 1) in the middle of the park. Seeing the sign cued her to visit her city's website to find out more about the project. However, this was not without its challenges. Because she was walking her dog, it was inconvenient for her to look up information on her phone about the sign. Instead, she had to remember to look online for information once she returned home.

*"I'm out there with the dog... saw this sign and then went to the city website and saw they actually have a forum for me to voice my opinion about parks development. I don't think a lot of people even know what kind of information is on the city site. Sometimes the layperson doesn't know what to search." – P7, Female, Age 52*



Figure 1: A participant's (P7) post about a park's development project sign.

Most participants in our study were not as successful as P7 in finding more details about the community aspects they were interested in. Gathering location-specific information was often difficult because signs contained minimal descriptions. Many users also expressed concerns with location detection and enabling GPS tracking on mobile phones to track their routes and destinations. This meant it was necessary for people to search online to find more information. Yet knowing where to look was especially challenging and there was not a way to 'link' from content on a physical sign or occurring in a physical location to content on the web. As a result, many participants were not able to surface more information about an interest they had. Some simply did not try because they felt it would be too difficult, while others would forget to do so when they returned home.

## 6 TIME-BASED INFORMATION

We also found that participants were very interested in what we call *time-based information*. We define this as information that is needed 'before-the-moment' so one could plan activities based on it or around it. First, the most common type of time-based information related to *community* events and *recreational* activities for families. This information was needed to inform adequate household planning. For example, family members liked to know about swimming lessons at a nearby community centre that they could sign their children up for, upcoming community events related to holidays, etc. Participants with children described the importance of knowing the schedule for recreational activities weeks or months in advance in order to plan for holidays and school breaks.

*"My husband and I work full-time, so if we want to take a family vacation we need to plan for it at least 6 months ahead of time. We also have to think about kids' school days off, holidays, and summers, and what to do with them then." – P5, Female, Age 42*

Unlike the location-based information from the previous section, this type of time-based information was not location-dependent in terms of where the activity or event would eventually occur. That is, participants described wanting to know about it when they were at home, rather than the location that the event would happen at. For example, it was important for a family to learn about upcoming swimming lessons when they were at home and could also look at their family calendar, rather than when they happened to visit the local swimming pool. Yet the reality was that it was difficult to find this information online when at home. In contrast, when at the recreational centre or at the swimming pool, printed flyers were readily available and showed such information. These could certainly be brought home, but it would mean that a family member had to visit the recreational centre first to acquire the information in order for it to be acted upon.

Second, *traffic* information was also described by participants in a way that made it time-based and was desired ‘before-the-moment’. Many participants expressed frustration when caught in the middle of a construction zone or a traffic jam. In this case, people expected to become aware of this information before heading in that direction. In most cases, this meant learning about traffic conditions when at home or at work, in order to pre-plan routes and commute times. Traffic information differed from recreational and event information because it needed to only be known several hours ahead of time; this contrasts the weeks or months that was necessary for family recreational activities.

Third, administrative tasks associated with one’s community (e.g., property taxes, dog licensing) were also described as time-based activities. Participants revealed that although administrative tasks were recurring, they often only became aware of them when they received a routine invoice, such as a utility bill or property tax bill. Upon receiving the invoice, participants would often mark the due date on their calendar or to do list. Over time, participants became accustomed to the frequency and time of year that such bills were due, but relied on the actual delivery of the bill from their government agency to cue them to the city website to pay. This needed to occur *before* the deadline of the bills, for obvious reasons.

*“We’ve lived here for over 10 years so our property tax bill comes every year around the same time. I usually get the bill and tell my husband about it so he knows the bank account will be short a few thousand [dollars].” – P12, Female, Age 40*

Perhaps the most interesting aspect about time-based information (across all three of these information types) was an expectation by participants that this information would surface and present itself to them at the appropriate time and place. Thus, rather than feeling that they needed to go online and actively find the information themselves, in many ways, they expected this information to be ‘delivered’ or ‘presented’ to them by some source where someone else or another service would show them what was relevant to them given their location (e.g. where they lived) or their general interests. This greatly contrasts the ways in which current government sites are designed to present information to users, where it is ready and waiting for them to search through it. In the next section we build on the idea of ‘surfacing relevant content’ by describing curated content.

## 7 CURATED LOCAL INFORMATION

It was very clear from our results that our participants wanted to know about community and government information that was specific to them and their immediate family. One might assume that people might search out specific information of family relevance, by, for example, conducting web searches or looking at a government website. Yet, in contrast, people had a more passive consumption model where the information would, in essence, come to them during their everyday routines in somewhat of a curated form.

First, this happened with local newspapers that were delivered to homes at least once per week. Many participants relied on them as their main source of community-relevant information. It was not the case that participants went out of their way to find and retrieve these papers. They were delivered as part of the normal newspaper delivery system and brought local community information *to* the participants. Participants would then skim the headlines within the newspapers to understand what might be of local relevance to them and to then read further on these items. Not everything in the newspapers mattered, but what participants found valuable was that all of the contents *could* matter. Thus, it was worth their time to quickly go through it. Because the newspaper was targeted at local happenings, participants knew

that the likelihood of something being relevant to them was high. In this way, the editors of the newspaper were curating content of local relevance for our participants.

*“We get a paper delivered weekly to our house that my husband skims. It just keeps us updated on things happening around our city. It’s different from going online and reading about other parts of the world.” – P5, Female, Age 42*

Thus, local newspapers offered a wealth of local community information (from nearly all of the categories of information that we presented), including details on *maintenance* activities, *recreational* opportunities for the family, issues pertaining to *legal* happenings and bylaws, *traffic* happenings, *community* events, and sometimes *environmental* concerns.

Second, some of our participants used online newspapers or local television news programs to fulfil a similar role. Here participants would turn to online aggregator news sources, such as Google News or Yahoo News, to skim headlines that surfaced articles of potential interest. They might also watch the local news on their televisions. Again, there was a focus on curated local content; that is, content that was specifically placed within a ‘local’ section of the online news source. Participants recognized that this was the most likely location for them to find out what happenings should be most important to them at a community level. Again, participants did not turn to their local government websites. They also did not use government-based social media. Such services were not seen as offering the same value as other aggregators or news sources.

*“I don’t go to government websites to get information. I get info mainly through online media, and I would say... maybe once or twice a day, I would go to Global Mail or Google News for it.” – P15, Male, Age 27*

Somewhat surprisingly, we learned that participants did not use their mobile phones to acquire information from these sources. Instead, participants were restricting their access of local community information to the context of the home, typically on a personal computer or laptop. This was because the home was the location in which the information was actively thought about and discussed by family members. This likely reflects the continuing success of local newspapers which are hand-delivered to people’s homes.

## 8 INFORMATION SHARING THROUGH PRINT AND TECHNOLOGY

Families still relied on the affordances of paper-based media, as it provided them with unique ways to read, post, and share information about their community. Print-based media such as newspapers or other recreational notices would arrive at participants’ homes and would be moved between locations in the home, depending on who should see it next or the relevance of the information (similar to [9][13]). Some participants noted that a central message board allowed for more free-flow content to be shared and coordinated with other family members.

Participants with children had a strong preference for print-based materials when they wanted to schedule their children’s recreational activities. It allowed them to physically cut out or annotate items to then share with other family members. In this way, one family member often acted as the ‘family curator’ to discern what was relevant for specific family members from within the already curated information that families received in their local newspaper or other print items arriving at the home. This is somewhat akin to the ‘family scheduler’ role described in other research [28][29]. Despite the same information being available in a digital format, participants preferred the tangible nature of print-based media so that it could become more easily noticed in the home.

Participants also shared knowledge of community happenings with their immediate family members using several communication technologies. Information shared between spouses included details of administrative tasks (e.g., any items related to bills), community events, recreational activities, and traffic issues. In contrast, information shared with children often surrounded confirmed activities. Our participants preferred to use the asynchronous methods of text messaging and email to share community information with their family members. This was seen to be less intrusive than phone calls, which were only used for urgent situations. Asynchronous methods also served as a way to note and share reminders, either via text or photos.

Yet what we found to be different with community information when compared to other aspects of family communication (e.g., greetings, checking in, and coordinating rides) was the point in time when information was relevant for family members to see it. That is, information exchange and discussion often occurred at *two* different points in time. First, there was the act of information delivery where one might send a text message about an event to a family member during the day while they were at work. Second, there was the discussion period about the event that happened later in the day. For example, a spouse might send a partner a text message about signing a child up for swimming lessons. Families found it important to send this information immediately, but then also have it come up for a face-to-face discussion at a later point when they were collocated. This suggests that participants would value technology that was able to ‘resurface’ information at a later point. Because participants did not use any technology to do this, it was often difficult to remember what needed to be talked about when family members were together.

In addition to the above, some participants even talked about the desire to connect with people outside of their family and friends in relation to community information. This was seen to be especially valuable in physical spaces, where people might be able to connect because of a mutual interest. For example, P7 discussed her ideas for a designated off-leash dog trail at her neighbourhood park, but admitted that she had no idea whether others visiting that park shared similar ideas. She wanted new ways to talk to other community members about the park and saw technology as a means to facilitate such discussions, e.g., an online forum or digital petition.

## 9 DISCUSSION

Our study has documented when, where, how, and why community information is sought out by families and what challenges people faced in acquiring and sharing this information. Overall, participants valued specific community information that was relevant to them and their families. This was seen across all categories of information participants posted about and also when participants described the ways in which they sought location- and time-based information and through curated content. We now discuss design opportunities in these areas along with the ways in which digital and non-digital tools and resources were used as part of their existing routines.

### 9.1 Location-Based Information

*Location-based* community information was desirable to support awareness within specific locations in people’s local surroundings. People expressed frustration with having to first remember to conduct an online search, and, then to actually conduct an online search. For example, a person walking around a neighbourhood may come across a rezoning development billboard, make a note to remember to look it up, and then upon returning home, search on their government website for additional information about the project. However, in situations such as this, the expectation is on the user to take action. Government organizations have the opportunity to

be proactive and offer modernized technological solutions that would alleviate this expectation. Rather than adding the rezoning information to their website, such information could be available on an interactive public board at the location. A person could scan a QR code and bookmark the information to review at a later time. This suggests opportunities to present digital information ‘in-the-moment’.

While we are beginning to see the growing use of QR codes in linking people directly to additional online information, systems should consider how to expand its usefulness by extending its functionality from information display to interaction. For example, Google Now tracks a user over a period of time and intelligently surfaces relevant information based on patterns of locations visited, emails received, persons contacted, and online searches. However, Google Now does not yet focus on the granular details of community information and government services. Additionally, in reality, many of our participants did not want to turn on location-detection services on their phones because of trust concerns. This presents an open design problem. Designers will need to think about how they can foster trust, such that people will enable such location-based services. Google Now also does not allow people to easily share information with others, beyond one’s location. This contrasts the desires of our participants who actively shared information with their family members. This suggests design opportunities to share community-based information with family members within a closed network.

### 9.2 Time-Based Information

Participants identified *time-based* community information (such as recreational events, traffic, and administrative tasks) as the most valuable information in terms of helping plan family activities and routes between work and home. We now see systems being designed to support similar information. For example, systems such as Waze and Haze offer traffic updates and alternate routes, sourced and shared by other drivers; however, a large amount of user interaction and entry is required to acquire this data. This information is also often provided in real-time, as opposed to the desired ‘before-the-moment’ to avoid encountering traffic issues along a particular route. Additionally, these systems are focused solely on providing an awareness of crowd-sourced traffic conditions. Sharing additional information related to traffic and location with other family members would require users to use other tools, such as the phone or text messaging. For example, if a user decided to take another route home due to a traffic situation on their regular route, they would be required to take an extra step (using another tool) to notify other family members that they were doing so. Future system designs could consider a more integrated, multi-featured application where user interaction is not required to share this type of information with a family member.

Our study results also suggest that government systems could provide increased value by providing various demographic groups with information that may be of specific relevance to them, rather than following a ‘more is better’ approach and posting all the information online. For example, families with young children will likely be interested in information offered in a community recreational guide. Technologies could try to surface such information for these families. Of course, this raises privacy concerns related to tracking very specific information about people and acting on it. Having services use personal data to target content at people is a known societal issue presently. In addition to this problem, surfacing information to an entire family neglects the fact that there may be individual information preferences within a family unit. While people are generally less concerned about privacy when information is only shared with a close-knit network of family members, we recognize that not all information is shareable at the same levels with every family member. This is an important

consideration for location-based experiences and such concerns need to be balanced with the technological benefits.

### 9.3 Designing for Sharing Online and Printed Content

Much of the information people used to maintain an awareness of community happenings was curated in the form of print newspapers, online news aggregators, and local TV news broadcasts. While much of this behaviour is passive (e.g., people are skimming headlines to gauge relevance), we can imagine designing systems that consider how this information is presented. For example, systems can highlight news specific to a person's local community and interests. This may be different for each family member, suggesting that users should be able to customize their own experiences based on their particular needs. Systems can also consider curating content that would automatically display content specific to the person's historical activities and interests. Some newsreaders are already doing this (e.g., Zite) and could be extended to include content from a wider variety of community information sources. As a result of designing for such diverse uses, systems should consider granular (but simple) privacy controls to help share information only as desired.

Not surprisingly, people visited online news sources or watched the local news on the television to maintain an awareness of events in their surrounding areas. This was often part of participants' daily routines. Participants described sharing links to online news articles to family members if they thought it was of potential interest to them. Yet we found that digital pieces of information accessed on a personal mobile phone or computer can quickly become forgotten if it is not physically visible in the home. This suggests that there may be value in having ways to convert digital online sources into a more tangible presence in the home. Designers will need to consider how to provide ways to access information in specific locations as people come across it. For example, some designs have used physical objects as tokens to trigger digital content [25][30]. Similar systems could be designed to focus more closely on the broader set of community information that family members want to know about and share with others.

People also maintained an awareness of their community using more traditional methods, such as reading the newspaper, or skimming paper-based recreational guides. The visibility of these physical artefacts (whether it was delivered to their homes or left on a table by another family member) often served as reminders to take further action. This is similar to the way previous research has reported families placing communication information in contextual locations within the home [9][10][11]. While the physical act of annotating physical artefacts was a preferred (and common) behaviour, certainly over time such items accumulate, take up physical space, and become lost once it is discarded. This type of accumulation has been reported in past research along with family routines for managing it [9][10][11][13][40]. Though past literature shows how people place/move paper-based information in the home, it does not show what aspects of it is community-based information specifically and how people learn about their community through this media. Overall, we feel our study findings suggest opportunities for leveraging the affordances of print-based media and converting them into digital form once ready to be archived.

Other researchers have explored the role of paper versus digital artefacts in office environments to find that paper-based documents are valuable for work in the present, whereas digital documents are most important for sharing information prior to working on it or for archival purposes [37]. Within the context of family life, physical forms of media such as newspapers, bills, and letters can serve as calls to action, but if required, digital information can easily be sent to family members who may not be

physically present at the same time. It also offers the ability to archive information that may be needed at a later date (e.g., annual tax bills, medical records, etc.).

### 9.4 Tools for Communicating Across People and Places

Participants wanted to share community information, whether it was with a single person in their family or within their larger social network. A small number of participants also valued having a forum in which they could discuss their community ideas and concerns with others more broadly. Similar to StickySpots [11] and Place-Its [38], family members wanted to have information resurface at a particular point in time where it was tied to a specific location. This suggests there exist benefits to having digitized community information automatically resurface itself at relevant points in time. For example, imagine if a parent could digitize a physical notice for a community parade set for the following month and then have it automatically re-appear at a relevant time before the parade. The notice could also be automatically sent to relevant family members, such as both parents. Items could also surface themselves on in-home displays such as a digitized kitchen table if more conversation is needed to plan out an activity.

Family members also wanted to have the ability to delay communication to a time that is convenient for the other person (e.g., people read emails and text messages at their convenience). System designs should consider features of such tools to share information, including how to use delayed messages to support real-time conversations. That is, email, photo and text messaging can be used as a way to remind others about a particular task or topic. As such, systems may consider ways to foster face-to-face interactions once all family members are collocated in a space. For example, a person may send a quick text message to her spouse; this text message could then surface at a time when both people are at home in order to prompt further conversation. System designs could also consider aspects of location-based services to facilitate the surfacing of information based on the user's location, further minimizing the amount of user interaction required to retrieve information.

### 9.5 Limitations

We recognize that while valuable, our study results come with their limitations. We focused our study on adults who were primarily responsible for a household. Our work should certainly be complemented by additional studies that explore the perspectives and experiences of family members in other age groups. We also investigated people who resided in a large metropolitan city, were fluent in English, and were employed in full-time professions. Thus, the communication practices and routines are fairly straightforward and do not consider any cultural implications of remote areas, other languages, or income levels. This suggests additional investigations into community information needs and routines of families in smaller towns, with mixed cultures, and diverse income levels. Such studies will enrich our knowledge in understanding the larger representation of people living within a variety of communities. We also note that our study was conducted in Canada. Thus, our results are specifically applicable to Canadian cities but may be generalizable to practices within North American and Western European cities.

## 10 CONCLUSION

Our paper contributes a study of the community information needs and practices of families. Through a two-stage diary and interview study we found that people often wanted location-based information related to places they would encounter throughout their day, whether on route to work or as part of their daily

routines (e.g., dropping kids off at school or walking the dog). People also valued time-based information to help plan family activities. People often referred to multiple sources of print and online news sources that were curated based on their relevance to their local community. Our focus on people's interests and locations extends findings presented in related work in the areas of domestic systems and social media. Overall our work suggests that government and domestic systems may benefit from personalized experiences which surface curated information relevant to the person, rather than relying on the person performing searches for routinely accessed information.

#### ACKNOWLEDGMENTS

This research was funded by the Natural Sciences and Engineering Research Council of Canada (NSERC) and the GRAND Network of Centres of Excellence.

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