

Article

Playful Meaning-Making as Prosocial Fun

John M. Carroll ^{1,*} , Fanlu Gui ², Srishti Gupta ¹ and Tiffany Knearem ¹¹ College of Information Sciences and Technology, Pennsylvania State University, Hershey, PA 17033, USA² Vanguard Corporation, Malvern, PA 19496, USA* Correspondence: jmcarroll@psu.edu

Abstract: Smart city infrastructures enable the routine interleaving and integration of diverse activities, including new ways to play, to be playful, and to participate. We discuss three examples: (1) citizen-based water quality monitoring, which combines outdoor exercise and social interaction with safeguarding public water supplies, (2) a digital scavenger hunt, which combines the experiences of a community arts festival with shared reflections about significant community places and events, and (3) public thanking, which encourages people to acknowledge neighbors and local groups that serve and strengthen the community. Each of these interaction possibilities in itself alters lived experience modestly. We argue that lightweight and playful meaning making activities can be *prosocial fun*, that is to say, they can simultaneously be playful and fun, but also substantive contributions to the coherence and richness of a community.

Keywords: community engagement; prosocial fun; smart communities



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1. Introduction

Smart cities are physical places augmented through advanced information technology infrastructures that allow the places to be more responsive and adaptable, and thereby “smart” [1]. Thus, sensor-based monitoring can provide smart management of parking, lighting, heating, and storm water (e.g., flooding); autonomous systems can provide driverless transportation and optimized management of traffic, supply chains, and communication networks. These infrastructures save time and energy and provide greater safety, comfort, and convenience.

Smart city infrastructures also raise new challenges. Reliance on smart infrastructures entail new kinds of vulnerability to attacks on data security. The deployment of closed-circuit television (CCTV) and face recognition capabilities in streets and other public areas can enhance personal safety in the street, but have raised concerns about personal privacy, and undermined trust in information technology, and specifically in the smart city vision [2].

Beyond the direct effects of enhanced infrastructure (access to networked services, recycling and upcycling of sewage, and so forth), smart cities afford new possibilities for human activity. In this paper, we are particularly interested in how new sorts of information infrastructure can facilitate human activities that interleave and integrate play and playfulness with civic engagement and participation. We refer to this category of activity as *prosocial fun*. We want to explore contributions to community that are real and meaningful, substantive contributions to community identity, participation and social support, but still lightweight with respect to organization, infrastructure and commitment—they are things people can do as they move around throughout the community, things they can do with friends or in making new friends.

Why might prosocial fun matter? Prosocial practices that are easy to adopt (because they are fun) might be more accessible to a wider range of people, and thereby might be more effective in communities and societies. Conversely, fun that is socially meaningful, and beneficial to others, might be more sustainable, might be experienced as more than “just” fun.

2. Background

A city is people; a structure of neighborhoods and communities, at various scales, each a social system that interacts with the others, and with other structures of the city—commercial areas, industrial areas, physical and information infrastructure, etc. Requirements and possibilities for smart cities must be identified and analyzed with respect to the diverse organizing structures of cities, including neighborhoods and communities.

Human community is personal commitments, experiences and relationships and has a strong focus on member's connection to their community and to others within it. *Community identity* is built through shared stakes, achievements, capacities and traditions, and enables a sense of membership and attachment, bringing a community into being [3,4]. Members continually enact community identity through sharing and recognizing values, and cultivating feelings of belonging and connection. People who identify with a community report that they are "from" that community. Feeling attachment for the community is core to one's sense of community [5].

Local participation transforms identity commitments into publicly visible engagement and contribution. Members initiate and innovate practices that strengthen and stimulate, as well as challenge the community. Visible collective activity, time spent in public, awareness of local news and issues, casual socializing with and volunteering for community service are typical examples. Participation leads members to both feel and observe self-efficacy and community efficacy. Participation enables *dense and diverse support networks*, which refers to the roles that individuals take in providing and reciprocating social support within the community. Members play a variety of roles in relationship to one another. A person can be a resident of a downtown apartment building, a parent, a shop employee, a regular customer, or a volunteer at the food bank. Each of these relationships connects the person to others through giving and receiving various kinds of social and material support [6]. These multiplexed and involuted ties throughout a community enable both bonding and bridging social capital [7]; they strengthen and diversify identity, participation and support [8]. These facets are distinguishable but not independent of one another and capture the fundamental aspects of *community engagement* [9].

A *smart city* must comprehensively integrate technology, people and institutions [10]. Although technology infrastructures are key to the concept, smart cities are more than application contexts for technologies such as artificial intelligence (AI) and sensors. Ref. [11] introduced the term *collaborative community* to describe how communities and their institutions such as local government, non-profit organizations, and private organizations should be able to leverage smart infrastructure to improve overall quality of life. The possibility of such collaborative communities hinges on engaging people and communities in the smart city. This includes creation of human infrastructure (such as employment and workforce), social capital, and knowledge capital (community learning). Smart infrastructure is unlikely to be pure panacea; people must be engaged in order to manage emerging vulnerabilities and unintended consequences. For instance, biased outcomes of a black box artificial intelligence system can disrupt lives in critical situations such as a medical diagnoses. User-centered algorithm designs can leverage human strengths to make AI more robust and explainable, by making processes more visible [12].

To achieve smart communities, it is imperative to ask how technological infrastructures can support human engagement in community, such as identity commitments, participation and awareness, diverse social support network. In this paper, we explore the strategy of leveraging the experience of *fun* to sustain engagement. Fun has long been recognized and investigated in human–computer interaction (HCI) research as a key to evoking and sustaining motivation [13,14]. Often, this has been a focus on what might be called pure play, hedonic or ludic fun [15,16]. The focus has less often been on eudaimonic fun [17], that is to say, on meaning making, well-being, autonomy, and growth [14].

We suggest that eudaimonic fun can and should be recruited to prosocial activities in the smart community. In the following sections, we explicate pro-social fun as a framework for smart community by drawing on three cases: citizen-based water quality monitoring,

digital meaning-making activities for community engagement, and visible public thanking of community volunteers.

3. Citizen-Based Water Monitoring

Ensuring safe water is critical for survival. Water crises around the world are increasing due to population growth, pollution, global climate change etc. Much water quality monitoring requires human direct data gathering in local watershed areas, a kind of citizen science, where citizens collaborate in scientific endeavors in different ways such as volunteering, transcribing, data collecting, data analysis etc. [18,19]. Importantly, the number of citizen scientists participating in a watershed predicts water quality [20]. Moreover, it facilitates community engagement, community development, informal learning, and trust between stakeholders. Moreover, increased availability and accessibility of technical infrastructure to disseminate knowledge and collect data has engendered these sociotechnical affordances [21,22].

In citizen science, *contributory* and *collaborative* projects are often distinguished. Contributory projects involve citizens in data collection and analysis. In collaborative projects citizens take more initiative and responsibility for planning and leading projects [23]. Contributory projects are the majority of citizen science projects; they require less intensive training. In studying the space of technologies in the citizen science of water monitoring, we found that projects increasingly leverage the popularity of social media to collect water quality data [24]. Citizen science teams either use existing social media platforms or create social media style designs to collect water data. We conducted a study with an application called *Water Reporter* (<https://www.waterreporter.org/>, accessed on 28 September 2022) (Figure 1) that uses Instagram style interface to collect data in the form of photos and photo meta data [25].

We found citizens are often concerned and eager to contribute to local conservation activities but are unaware of ways they can get involved in such a professionalized scientific area. However, using familiar tools like social media in citizen science, not only allows people to contribute to science and local conservation activities, but also makes it fun [26]. People can take pictures on their community walks, post on social media, and use the interactive features to interact with other community members. Such a design also makes citizen science activities more visible and transparent by allowing citizens to see what other people in their neighborhood are posting, learn and support each other through various interactive features. Hence, contributory activities are easy to get into prosocial fun and make them more sustainable. The social media design scaffolds a lightweight activity to more fun and elaborate contribution.

We also conducted a study with a collaborative citizen science community. We identified community-based water monitoring groups in a watershed in Center County, Pennsylvania and conducted an empirical study to understand their sociotechnical practices [27]. We first identified key stakeholders involved in monitoring activity and conducted interviews to understand their motivation and practices. We then organized design hackathons with key stakeholders and community members to brainstorm and discuss collective monitoring practices, opportunities and constraints, and possible design scenarios to ameliorate current practices and make this community initiative more visible.

Our interview findings revealed that most of the volunteers were older adults who did not have a prior background in water sciences. They were motivated to conserve their local watershed, to learn and pursue engaging post-retirement activities, and to be part of a socially-engaged group. Volunteers undergo training to learn about water quality testing and handling monitoring equipment. They use bulky equipment to collect samples from the stream, and use online spreadsheet tools to store and analyse their data. Most of the time data collected by citizen groups is openly accessible to the public. Data collection and analysis in a stream is a strenuous physical activity, especially for older adults. Water monitoring activity also provides an opportunity for groups to socialize and build strong inter-personal relationships with each other. Groups would often go out for social lunch to

relax after a monitoring activity, organize fun social events like weekend picnics, hikes etc., and also take initiatives to engage with the broader community through programs such as informal learning events for school kids.

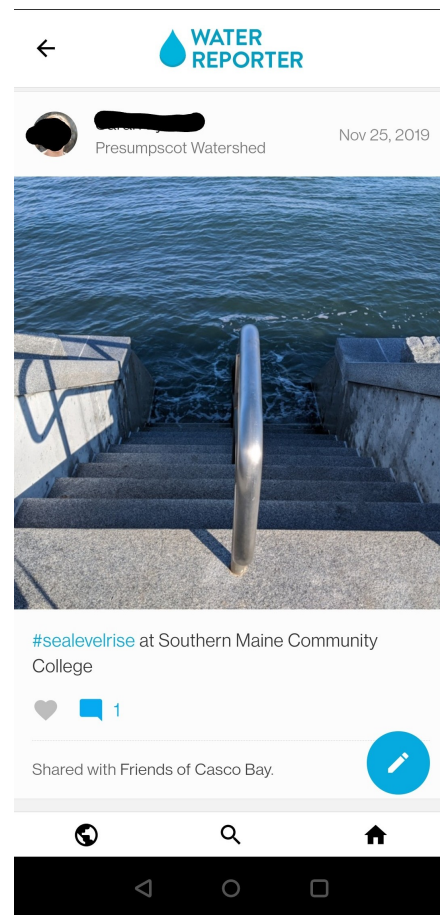


Figure 1. Screenshot of Water Reporter App.

In addition, we also conducted seven participatory design hackathon sessions both with water monitoring groups and community members who are not part of these groups. The goal of these hackathons was to brainstorm design ideas to make the community-based water monitoring practices more effective and visible in the community. To facilitate these sessions, we designed a preliminary prototype of a water data platform (Figure 2), based on our initial interviews. This prototype was used as a prompt to evoke discussions and generate design ideas and scenarios. Through the course of the seven design hackathons, the prototype was iteratively improved incorporating various design scenarios produced by participants of the hackathons.

This study helped us understand how collaborative citizen science can enrich people's community experience. Whether citizens are involved in the water monitoring activity or not, all community members were concerned about their local water system and were eager to cause a change. Community members were also keen on dissemination of knowledge of water resources and data to the entire community, to promote informal learning about science and local community. The prototype was hence designed to incorporate a water data platform, data visualization and interpretation, community discussion forums, and informal learning modules for both and adult and youth members of the community. Hence, participating in local water quality monitoring helps in building a community identity. The elaborate social structure of groups in the Spring Creek Watershed resonates the notion of a core community structure, as these groups are loosely tied but share similar community commitments, practices and identity.

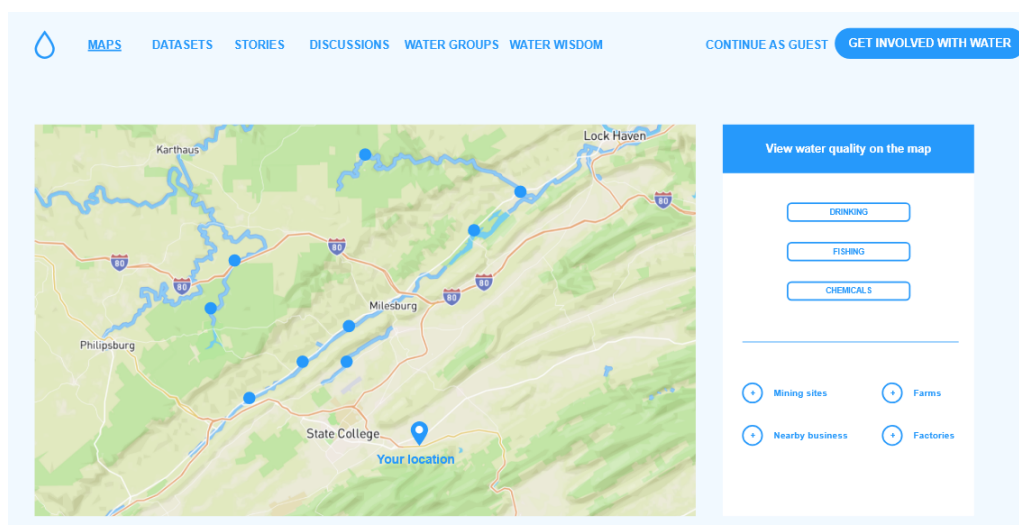


Figure 2. Screenshot of home screen of water data platform prototype.

Monitoring streams not only protects water, it provides enjoyable, healthy and socially rich experiences to citizens. People authentically experience the sense that they can make a difference for the community. This will lead to both scientific advancement, and a more engaged and knowledgeable community [28]. Water monitoring can be considered a core non-profit community work analogous to Meals on Wheels, Habitat for Humanity, food banks, timebanks, volunteer fire organization etc. It is a form of community engagement where social interactions enable citizens to build social capital, trust and experience increased sense of community.

4. Festival Engagement

Many communities celebrate local festivals centered around food, arts and crafts, rides and amusements, musical performances and other aspects of the local culture. Festivals are intended to be fun, of course, but they also play a significant role in community life, including the facilitation of social cohesion and regional identity through the public and collective activities of the festival [29–33]. Festival attendees who had a pleasurable experience develop a level of emotional attachment to the community, which is reflective of the influence of emotional bonding with other attendees and an identification with place [34].

The ephemeral nature of a festival temporarily changes the atmosphere, encouraging interactions outside the usual day-to-day. This can energize citizens to engage or reengage with their community [35–37].

We have deployed a series of information tools and activities to study aspects of community engagement and identity development during our city’s annual summer arts festival. Initially, we released a mobile app which provided users with mobile tools relevant to time and locational contexts at the community festival. This study showed how technology can scaffold connection and engagement throughout a community. Han et al. [9] developed an app for a local festival where users could interact with each other’s photos and videos. The feature was found to contribute positively to people’s connection with others and the community. In another study, Wang et al. [38] investigated the meaning of place through introducing a web app at a festival where attendees could share their festival stories with others in the community. The web app motivated community engagement through facilitating reflection on memories and learning about others experiences. Most recently, Knearem et al. [39] deployed a mobile scavenger hunt during the festival to understand how people could develop their personal sense of community identity through searching out activities around the festival.

To exemplify pro-social fun in a community event atmosphere, we elaborate on the study by Knearem et al. [39] of the mobile scavenger hunt app. In this study, we wanted to

determine the extent to which a casual and lightweight interaction, i.e., engaging in the digital scavenger hunt app, could evoke community engagement and reflection to support the construction of community identity. In a typical scavenger hunt, players are required to collect a number of miscellaneous objects (e.g., complete missions) that can be found in a specified geographical area (For more details, visit https://en.wikipedia.org/wiki/Scavenger_hunt (accessed on 28 September 2022)). To hone the focus towards engagement, we crafted nine open-ended missions based on three themes: making memories, reflecting and reminiscing, and community discovery. They were designed to appeal to a wide range of attendees and to encourage them to explore the various facets of the festival and local area. For each scavenger hunt mission, users were asked to take a photo of their target and author a caption for their photo (optional) based on the mission prompt. Users could view other user's photos in the News Feed feature, and could see who was playing on the app's Leaderboard. Figure 3 shows the app screen with the mission list.

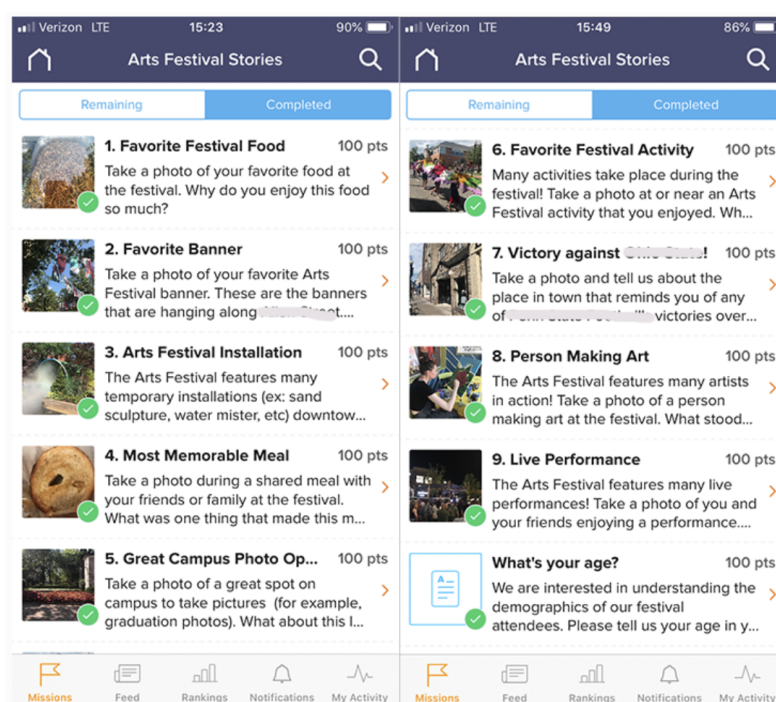


Figure 3. Mobile Scavenger Hunt Mission List.

Our interview findings suggest that the mobile scavenger hunt was perceived as engaging, exciting and undemanding within the context of the festival. The app's features, especially the missions, encouraged physical exploration of the local town and engagement in a wide variety of public activities. We found five key impacts of the mobile scavenger hunt app on people's festival experience: it brought attention to *community artefacts and landmarks*, contributed an *awareness of others* in the community as more than just passerby, oriented people to the *community's culture and values*, encouraged *new experiences*, and provided *opportunities for reflection* on community events and personal memories. Through the key impacts, the mobile scavenger hunt facilitated synchronous and collaborative activity, and made visible the collective actions of the group. Full details on the methodology and findings can be found in Knearem et al. [39].

The five key impacts suggest a new approach for strengthening community identity through lightweight mobile interactions. The festival provided a backdrop for exploration, and a chance to discover ephemeral, out-of-the-ordinary experiences. Because the festival is not a permanent part of the community and only takes place for a short time once per year, it gave people a reason to come together to enjoy public space. The scavenger hunt app provides an alternative way to think about how to engage a community. It is approachable and brings people to participate in local events through a series of undemanding micro-

engagements. Taking photos for Missions engages people in the objects and activities in the community. Annotating the photos with captions is a form of social engagement, through sharing one's own experience and memories with others. Both forms of engagement celebrate community identity and enact community through creating a shared emotional connection [5].

The mobile scavenger hunt presents a novel way of scaffolding community engagement. By participating just a little bit, reflecting a little bit, and becoming a little bit interested in what others are doing, people were experiencing community in a new way without the pressure of commitment. The micro-engagements that were supported by the app made visible member's actions and worked to enact community identity through partaking in activities, learning about and reflecting on the local area, and conversation through images.

As our line of research suggests, engaging in the community can be an enjoyable and lightweight activity. Utilizing community events such as local festivals as a context for engagement, ICTs can support the formation of community identity through reflection, participation, and communicating with other citizens.

5. Public Thanking

In public settings, people routinely acknowledge other people, saying "How are you?" as we pass by, or perhaps "Excuse me", if we bump into them. These acknowledgements are somewhat mechanical. It seems easier to notice that a neighbor did not clean up their yard than that they did, or to notice that a child is making an awful racket than to notice a child is well-behaved.

More sincere acknowledgement does occur though. We noticed in our local newspaper (*Centre Daily Times* Friday, 30 August 2019 (page 5)) a letter-to-the-editor that included a rather substantial enumeration of ways that anonymous neighbors had instantly come to assistance of an elderly woman who tripped and fell on the sidewalk. Recognition can exist in different forms including being mentioned in publications [40], seeing positive impact on one's local community [41], or receiving souvenirs and certifications from the non-profit groups [42]. Previous studies reported that such recognition can encourage community volunteers to continue volunteering [43–45]. Acknowledging the potential impact of the volunteers may also be helpful in volunteer recruitment [46]. This inspired us to try to provide scaffolding to evoke and curate an approachable public thanking activity, not necessarily situated in community crisis, and to investigate the impact of those who engaged in thanking as well as those who were thanked.

To investigate the impact of public thanking as well as its impact on different citizen roles, we designed and distributed public thanking station prototypes in community centers [47]. Figure 4 shows the setup of a thanking station. The goals of these stations were to present local volunteers' work and invite community members to participate in a thank-you card writing activity. Community members who stopped by these community centers can write thank you cards at the stations to show appreciation for local volunteers.

These stations included monitors that presented local volunteer groups' activity photos. The photos were displayed on an automatically repeating slideshow. No maintenance was needed to click through or change the slideshow. The slideshow contains photos of a variety of community services including animal rescue, environmental group, and suicide hotline, among others. For example, one of the photos captured the activities of senior volunteers who were collecting water samples in a stream. These activity photos were used to vividly communicate the services of local volunteer groups to other citizens who stop by the stations. Near the monitors, thank-you cards and instructions were provided to invite community members to appreciate local volunteer groups.

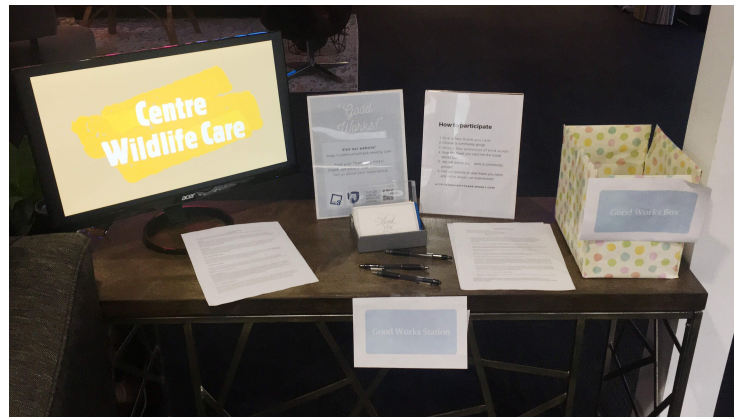


Figure 4. Public Thanking Station.

Thank you card writing was a self-service activity at the thank you stations. The stations were set up to be lightweight and function without facilitators. At the stations, participants can pick up a thank you card, choose a volunteer group, write messages to express appreciation, and drop the cards in a box at the station. As researchers, we collected, scanned, removed identifiable personal information, and uploaded photocopies of thank you cards to a publicly accessible website. We then reached out to community groups to notify them about receiving thank you cards.

We conducted interviews with participants about their experiences with the thanking station prototype. We interviewed community members who had different roles in the activity: community members who wrote thank you cards, as well as volunteers in community groups that received cards.

Community members who wrote thank you cards described the activity as fun, engaging, and meaningful. Thank you card writing evoked the memories of community support that the participants or their friends received from volunteer groups in the past. It also raised awareness of community support that was novel to the participants. In the thank you cards, many people appreciated community groups based on reflections of their personal experiences. Some participants were surprised to explore groups that they were not aware of. Their increased awareness of community support helped them to recognize the available local support resources in the community, if they ever needed help or if they would like to offer help in the future. This activity also encouraged participants to join the local support network in the future. For example, one participant mentioned that he would consider joining the volunteer group that he wrote a thank you card to in the future. Moreover, this activity allowed participants to recognize the support network, which strengthened community members' confidence in the local community's ability to grow and develop in the future.

Volunteers described receiving thank you cards as a way of reassuring the meaning and quality of their work and impact. Volunteers enjoyed receiving appreciation from community members who have received their service before, because it confirmed that their support was effective and made a difference. Volunteers also valued the thank you cards that were from community members who had not received services or interacted with the groups before. These appreciations were especially beneficial for the groups that did not directly interact with people to provide support. These groups were also often lack of visibility in the local community. For example, an environmental group that aimed to preserve birds may be less visible than a suicide hotline. The thank you cards acknowledged the effort of these less visible groups, and enhanced the volunteers' identity as contributors to the local community. These appreciations also motivated volunteers to sustain their volunteer work, which may potentially help the local support network to maintain its functions. As volunteers become motivated to sustain their work, other citizens in the community who did not participate in the thanking activity will also benefit from the continued services by having resources and support available in the community.

Public thanking station was a low maintenance and fun activity that can benefit citizens in several different roles (i.e., those who wrote thank you cards, who received thank you cards, as well as other citizens in the community). The thank you card writing activity helped those who wrote thank you cards expand knowledge of available support network, encouraged them to join the support network in the future, and strengthened their confidence and pride in the local community's ability to grow. Receiving thank you cards from community members enhanced volunteers' identity as impactful contributors to the local community, especially for the less visible volunteers. Moreover, the joy from appreciation may motivate the volunteers to sustain community services, which may also benefit citizens in the community who did not participate in the thanking activity.

The thanking station in this study was a prototype that illustrated the potential effects of public thanking, a fun and lightweight activity that can generate meaningful impact. This activity was different than passively presenting information that might be easily overlooked. The thanking stations drew community members attention by engaging community members to take actions. By writing thank you cards, community members responded to local volunteers' hard work. Volunteers were also able to benefit from this activity and feel appreciated. Moreover, the thanking stations did not require facilitators except the initial set up. This lightweight thanking activity can be easily implemented in community spaces. Future public thanking station can be designed to be more accessible and require even less maintenance. For example, future thanking stations can exist in digital forms. A digital community thanking forum may reduce the effort to supply materials such as physical thank you cards or monitors. However, physical thank you cards often give people a sense of personal touch. To sustain the personal touch, digital thanking can also be carried on using touch pads that allows people to preserve the uniqueness in handwriting strokes.

A smart city can provide more than seamless interaction or experience between citizens and places, such as smart parking or heating. It should use infrastructures to connect citizens with citizens; it should be socially smart. Public thanking can be that kind of smart city infrastructure. Information technology can help recognize good deeds, provide a platform to facilitate thanking, and make acts of acknowledgment more visible and more useful to the community.

6. Implications

We discussed three examples: (1) citizen-based water quality monitoring, which combines outdoor exercise with safeguarding public water supplies, (2) a digital scavenger hunt challenge, which combines the experiences of a community arts festival with shared reflections about significant community places and events, and (3) public thanking, which encourages people to acknowledge neighbors and local groups that serve and strengthen the community. Each of these interaction possibilities in itself alters lived experience modestly. We suggest that such lightweight and playful meaning making activities can be *prosocial fun*, that is to say, they can simultaneously be playful and fun, but also substantive contributions to the coherence and richness of a community.

There is no contradiction between enjoying playfulness and fun and, at the same time, contributing to civic life. To the contrary, experiencing playfulness and fun could enhance motivation to participate in and contribute to civic activity. Perhaps this is because playfulness and fun are more emotionally accessible to people than the weightier community responsibilities of motivating community volunteers, understanding the sacred places in a community, or securing the community's water supply. In this interpretation, people might feel more comfortable initiating or joining such serious community activities when those activities can be approached through more accessible participation in play and fun. One must initiate or join a civic activity in order to even have the opportunity to experience the meaning and fulfillment of such participation.

A similar interpretation can be raised regarding the sustainability of civic engagement. It is known that a proportion of new members in community activities ultimately drop

out. To some extent, of course, change in life activities is inevitable. However, continuing participation and contribution to civic activity might be more sustainable, at least for some people, if the activities better incorporated elements of play and fun. Indeed, the example we discussed of community-based water quality monitoring innovatively institutionalized a range of playful and fun components. Some are tightly integrated into the water quality monitoring activity itself, such as hiking together to study sites, others elaborate the core practice, such as going out for coffee or lunch after data gathering, or meeting to share and discuss monitoring data, and others have more to do with strengthening the playfulness and fun that the water monitoring activity itself, such as holiday luncheons. From this standpoint, it could be useful to identify and explore the intersection between those activities that are playful and fun and those that are civic contributions. This intersection could include activities that are more easily initiated or appropriated, and then sustained.

Participants in our festival scavenger hunt enjoyed collecting smartphone camera images and creating captions, but they also reflected on the significance of places they and other participants photographed. Citizens were delighted to be able to publicly acknowledge local volunteers, but also interested to learn more about the volunteer-based community groups. Thus, an immediate consequence of the playful public thanking activity was a small bump in community engagement. Members of the citizen water quality monitoring group enjoy hiking and gathering observations and samples, all the while socializing with their teammates. When they finish, they all go out for lunch together. Water quality monitoring is a social activity, but it also is the source of critical data characterizing the health of the local watershed.

Prosocial fun should be developed strategically to enhance the accessibility and sustainability of community work for larger proportions of the population. A smart city can be and ought to be more than adaptive infrastructure for power and sewage, it should provide specific support for playful meaning making. In a smart city, it should be delightful and uplifting to become an engaged citizen. It should be easier and more fun to become engaged than to become alienated.

One way this could be pursued is by enhancing the visibility of critical infrastructure to citizens, and encouraging their engagement and participation. Our festival scavenger hunt made significant community places and the personal meanings they have evoked more visible to participants; this made the places more meaningful for everyone. Our public thanking service made the contributions of citizens and groups to the larger community more visible, and made it possible to acknowledge these contributions publicly. Services like these could be pervasive in smart cities, providing opportunities for prosocial fun anywhere, anytime.

Smart city water management should of course be adaptive and resilient, preventing flooding or water contamination of various sorts. However, such systems should also help to make water systems more visible to citizens. They should make it more obvious to citizens that they can become engaged around water quality monitoring. The water reporter application discussed in the citizen-based water quality monitoring case study, is an example of such a technology that provides a lightweight, fun and accessible interface to engage citizens in this highly technical activity. The knowledge, skill, and caring that citizens cultivate for critical infrastructure, like water, is an important social good, as well as providing a context for physical and social activity.

A more deliberate integration of smart city infrastructures with prosocial fun could also help to provide a manual fail safe on side effects and vulnerabilities of smart infrastructure. For example, more thorough and more continuous surveillance of citizen activity can compromise personal privacy, and to some extent undermine citizen trust and engagement. This is already a well-known side effect, but detecting and addressing others in the future would be helped by having more citizens involved as active participants in smart city infrastructure development and management, as well as beneficiaries. If people are more aware of and more engaged by smart city infrastructures untoward side effects might

become apparent much more quickly. Thus, it is important to design smart cities to be visible, transparent, and approachable to people.

Smart infrastructures also entail new security vulnerabilities [1]. One way to address such challenges is to develop further automated monitoring (of the new vulnerabilities), though this strategy would lead to ever expanding levels of automated monitoring. A complementary approach is to engage people in their own infrastructure so they are motivated to be aware and vigilant. The participation of citizens in developing smart infrastructures should be framed not as creating adversity or polarization, but as enabling meaningful participation. To put this another way, if a smart city service requires that the people benefiting from it be unaware of what it is doing or how it works, this is a signal that something might be wrong with the concept.

In this paper, we explored three examples of playful meaning making in contemporary smart communities. The examples seem generalizable in that they leverage typical characteristics of communities, such as local water systems and sources, local not-for-profit service organizations, and local activities like festivals. Further work should continue to explore a broader range of examples to identify key community institutions and activities that can evoke and facilitate such meaning making. To help communities adopt these practices, it will be important to know more about how they can be conveyed, implemented and appropriated in diverse community contexts, and to expand the scope of investigations into how prosocial fun can contribute to and strengthen community and society.

Play can be pursued for its intrinsic benefits, that is, as purely ludic behavior, apart from, not coordinated with or contributing to the goals and meanings that frame ordinary life. Pure play is important to the life of the soul. However, it is also important that people can and do coordinate play with the goals and meanings of ordinary life. We argued that playful meaning making, modest projects of joy and reflection that are integrated into the flow of day-to-day life activity, can be a new resource for smart communities, prosocial fun, enhancing the accessibility and sustainability of community engagement for citizens.

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References

1. Kitchin, R.; Dodge, M. The (in) security of smart cities: Vulnerabilities, risks, mitigation, and prevention. *J. Urban Technol.* **2019**, *26*, 47–65. [CrossRef]
2. Van Zoonen, L. Privacy concerns in smart cities. *Gov. Inf. Q.* **2016**, *33*, 472–480. [CrossRef]
3. Carroll, J.M.; Rosson, M.B. Wild at home: The neighborhood as a living laboratory for HCI. *ACM Trans. Comput.-Hum. Interact. (TOCHI)* **2013**, *20*, 1–28. [CrossRef]
4. Puddifoot, J.E. Some initial considerations in the measurement of community identity. *J. Community Psychol.* **1996**, *24*, 327–336. [CrossRef]
5. McMillan, D.W.; Chavis, D.M. Sense of community: A definition and theory. *J. Community Psychol.* **1986**, *14*, 6–23. [CrossRef]
6. Carroll, J.M.; Rosson, M.B. Theorizing mobility in community networks. *Int. J. Hum.-Comput. Stud.* **2008**, *66*, 944–962. [CrossRef]
7. Putnam, R. The Prosperous Community: Social Capital and Public Life. Available online: <https://faculty.washington.edu/matsueda/courses/590/Readings/Putham%201993%20Am%20Prospect.pdf> (accessed on 28 September 2022).
8. Simpson, L.E. Community informatics and sustainability: Why social capital matters. *J. Community Inform.* **2005**, *1*, 102–119. [CrossRef]
9. Han, K.; Wirth, R.; Hanrahan, B.V.; Chen, J.; Lee, S.; Carroll, J.M. Being Connected to the Local Community through a Festival Mobile Application. Available online: <https://www.ideals.illinois.edu/items/91508> (accessed on 28 September 2022).
10. Nam, T.; Pardo, T.A. Conceptualizing smart city with dimensions of technology, people, and institutions. In Proceedings of the 12th Annual International Digital Government Research Conference: Digital Government Innovation in Challenging Times, College Park, MD, USA, 12–15 June 2011; pp. 282–291.

11. Snow, C.C.; Håkonsson, D.D.; Obel, B. A smart city is a collaborative community: Lessons from smart Aarhus. *Calif. Manag. Rev.* **2016**, *59*, 92–108. [[CrossRef](#)]
12. Baumer, E.P. Toward human-centered algorithm design. *Big Data Soc.* **2017**, *4*, 2053951717718854. [[CrossRef](#)]
13. Blythe, M.; Monk, A. *Funology 2: From Usability to Enjoyment*; Springer: Berlin/Heidelberg, Germany, 2018.
14. Carroll, J.M. Beyond fun. *Interactions* **2004**, *11*, 38–40. [[CrossRef](#)]
15. Gaver, W.W.; Bowers, J.; Boucher, A.; Gellerson, H.; Pennington, S.; Schmidt, A.; Steed, A.; Villars, N.; Walker, B. The drift table: designing for ludic engagement. In Proceedings of the CHI'04 Extended Abstracts on Human Factors in Computing Systems, New Orleans, LA, USA, 29 April–5 May 2004; pp. 885–900.
16. Hassenzahl, M. The interplay of beauty, goodness, and usability in interactive products. *Hum.–Comput. Interact.* **2004**, *19*, 319–349. [[CrossRef](#)]
17. Ryan, R.M.; Deci, E.L. On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annu. Rev. Psychol.* **2001**, *52*, 141–166. [[CrossRef](#)]
18. Silvertown, J. A new dawn for citizen science. *Trends Ecol. Evol.* **2009**, *24*, 467–471. [[CrossRef](#)] [[PubMed](#)]
19. Irwin, A. Constructing the scientific citizen: Science and democracy in the biosciences. *Public Underst. Sci.* **2001**, *10*, 1–18. [[CrossRef](#)]
20. Grant, L.; Langpap, C. Private provision of public goods by environmental groups. *Proc. Natl. Acad. Sci. USA* **2019**, *116*, 5334–5340. [[CrossRef](#)] [[PubMed](#)]
21. Kimura, A.H.; Kinchy, A. Citizen science: Probing the virtues and contexts of participatory research. *Engag. Sci. Technol. Soc.* **2016**, *2*, 331–361. [[CrossRef](#)]
22. Conrad, C.C.; Hilchey, K.G. A review of citizen science and community-based environmental monitoring: Issues and opportunities. *Environ. Monit. Assess.* **2011**, *176*, 273–291. [[CrossRef](#)] [[PubMed](#)]
23. Bonney, R.; Ballard, H.; Jordan, R.; McCallie, E.; Phillips, T.; Shirk, J.; Wilderman, C.C. Public Participation in Scientific Research: Defining the Field and Assessing Its Potential for Informal Science Education. A CAISE Inquiry Group Report. Available online: <https://eric.ed.gov/?id=ED519688> (accessed on 26 September 2022).
24. Ambrose-Oji, B.; van der Jagt, A.; O'Neil, S. Citizen Science: Social Media as a Supporting Tool. Available online: https://cdn.forestresearch.gov.uk/2022/02/social_media_support_citizen_science_april_2014-1.pdf (accessed on 28 September 2022).
25. Gupta, S.; Jablonski, J.; Tsai, C.H.; Carroll, J.M. Instagram of Rivers: Facilitating Distributed Collaboration in Hyperlocal Citizen Science. *Proc. Acm Hum.–Comput. Interact.* **2022**, *6*, 1–22. [[CrossRef](#)]
26. Liberatore, A.; Bowkett, E.; MacLeod, C.; Spurr, E.; Longnecker, N. Social media as a platform for a citizen science community of practice. *Citiz. Sci. Theory Pract.* **2018**, *3*, 1. [[CrossRef](#)]
27. Carroll, J.M.; Beck, J.; Boyer, E.W.; Dhanorkar, S.; Gupta, S. Empowering Community Water Data Stakeholders. *Interact. Comput.* **2019**, *31*, 492–506. [[CrossRef](#)]
28. Jordan, R.C.; Ballard, H.L.; Phillips, T.B. Key issues and new approaches for evaluating citizen-science learning outcomes. *Front. Ecol. Environ.* **2012**, *10*, 307–309. [[CrossRef](#)]
29. Manzo, L.C.; Perkins, D.D. Finding common ground: The importance of place attachment to community participation and planning. *J. Plan. Lit.* **2006**, *20*, 335–350. [[CrossRef](#)]
30. Light, A.; Howland, K.; Hamilton, T.; Harley, D.A. The meaning of place in supporting sociality. In Proceedings of the 2017 Conference on Designing Interactive Systems, Edinburgh, UK, 10–14 June 2017; pp. 1141–1152.
31. Wilson, J.; Arshed, N.; Shaw, E.; Pret, T. Expanding the domain of festival research: A review and research agenda. *Int. J. Manag. Rev.* **2017**, *19*, 195–213. [[CrossRef](#)]
32. Derrett, R. Making sense of how festivals demonstrate a community's sense of place. *Event Manag.* **2003**, *8*, 49–58. [[CrossRef](#)]
33. Waterman, S. Carnivals for elites? The cultural politics of arts festivals. *Prog. Hum. Geogr.* **1998**, *22*, 54–74. [[CrossRef](#)]
34. Lee, J.; Kyle, G.; Scott, D. The mediating effect of place attachment on the relationship between festival satisfaction and loyalty to the festival hosting destination. *J. Travel Res.* **2012**, *51*, 754–767. [[CrossRef](#)]
35. Jacucci, G.; Oulasvirta, A.; Ilmonen, T.; Evans, J.; Salovaara, A. Comedia: Mobile group media for active spectatorship. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, San Jose, CA, USA, 28 April–3 May 2007; pp. 1273–1282.
36. Cheverst, K.; Coulton, P.; Bamford, W.; Taylor, N. Supporting (Mobile) User Experience at a Rural Village 'Scarecrow Festival': A Formative Study of a Geolocated Photo Mashup Utilising a Situated Display. Available online: https://eprints.lancs.ac.uk/id/eprint/41912/1/scarecrows_final.pdf (accessed on 28 September 2022).
37. Peltonen, P.; Salovaara, A.; Jacucci, G.; Ilmonen, T.; Ardito, C.; Saarikko, P.; Batra, V. Extending large-scale event participation with user-created mobile media on a public display. In Proceedings of the 6th International Conference on Mobile and Ubiquitous Multimedia, Oulu, Finland, 12–14 December 2007; pp. 131–138.
38. Wang, X.; Knearem, T.; Yoon, H.J.; Jo, H.; Lee, J.; Seo, J.; Carroll, J.M. Engaging the Community Through Places: An User Study of People's Festival Stories. In Proceedings of the International Conference on Information, Cairo, Egypt, 24–26 March 2019; Springer: Berlin/Heidelberg, Germany, 2019; pp. 315–326.
39. Knearem, T.; Jo, J.; Wang, X.; Carroll, J.M. Seek and Reflect: A Mobile Scavenger Hunt to Develop Community Engagement. In Proceedings of the C&T'21: 10th International Conference on Communities & Technologies-Wicked Problems in the Age of Tech, Seattle, WA, USA, 21–25 July 2021; pp. 212–223.

40. de Vries, M.; Land-Zandstra, A.; Smeets, I. Citizen scientists' preferences for communication of scientific output: A literature review. *Citiz. Sci. Theory Pract.* **2019**, *4*, 2. [[CrossRef](#)]
41. Rotman, D.; Preece, J.; Hammock, J.; Procita, K.; Hansen, D.; Parr, C.; Lewis, D.; Jacobs, D. Dynamic changes in motivation in collaborative citizen-science projects. In Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work, Seattle, WA, USA, 11–15 February 2012; pp. 217–226.
42. Jung, J. The effects of recognition on volunteer activities in Korea: Does it really matter? *Int. Rev. Public Adm.* **2011**, *16*, 33–47. [[CrossRef](#)]
43. Fisher, R.J.; Ackerman, D. The effects of recognition and group need on volunteerism: A social norm perspective. *J. Consum. Res.* **1998**, *25*, 262–275. [[CrossRef](#)]
44. Winterich, K.P.; Mittal, V.; Aquino, K. When does recognition increase charitable behavior? Toward a moral identity-based model. *J. Mark.* **2013**, *77*, 121–134. [[CrossRef](#)]
45. Tan, J.; Jin, F.; Dennis, A. Attention or Appreciation? The Impact of Feedback on Online Volunteering. In Proceedings of the 53rd Hawaii International Conference on System Sciences, Maui, HI, USA, 7–10 January 2020.
46. Thomas, L.; Pritchard, G.; Briggs, P. Digital design considerations for volunteer recruitment: Making the implicit promises of volunteering more explicit. In Proceedings of the 9th International Conference on Communities & Technologies-Transforming Communities, Vienna, Austria, 3–7 June 2019; pp. 29–40.
47. Gui, F.; Tsai, C.H.; Carroll, J.M. Community Acknowledgment: Engaging Community Members in Volunteer Acknowledgment. *Proc. Acm Hum.-Comput. Interact.* **2022**, *6*, 1–18. [[CrossRef](#)]