A Sociotechnical Study of a Community-based Rewards Program: Insights on Building Social, Financial and Human Capital

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Individual empowerment is defined as an increased sense of confidence and control over one's life. Empowerment is critical in low-income communities, and can be facilitated through the development of social, financial and human capital. We present a qualitative study of a community program that seeks to empower low-income neighborhood residents through a mobile application that connects them to local resources. Our findings highlight how the application and offline socio-organizational mechanisms worked in tandem to create gateways for capital building—sparking connections (to people and opportunities) that residents leveraged with varying motivations and outcomes. We also discuss how the interplay of newly-developed financial, social, and human capital contributed to residents' sense of empowerment and impacted their families. We contribute to CSCW by extending an existing community informatics framework, characterizing the value of sociotechnical systems that holistically build social, financial, and human capital amongst neighborhood residents.[1]

CCS Concepts: • **Human-centered computing → Collaborative and social computing → Collaborative and social computing theory, concepts and paradigms**; *Computer Supported cooperative work*

KEYWORDS

Social Capital, Community Informatics, Empowerment, Community Engagement, Family Capital, Human Capital, Financial Capital, Mobile Application

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1 INTRODUCTION

Empowerment is defined as a process through which people are increasingly able to *control* the personal, social, economic, and political forces that impact their lives and *take action* to improve their life circumstances [22]. Empowerment is manifested at various levels; individual empowerment versus community empowerment. *Individual empowerment* refers to an individual's ability to make decisions and have control over their personal lives. Whereas, *community empowerment* is the collective effort of individuals and organizations within the community to deploy their resources in order to assist one another and have control over the conditions of their communities [22]. One common method of empowerment is through *social capital,* which is defined as "features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit" [39]. Social capital contributes to both individual and community empowerment [4,21,25,50]. Prior work has shown that socioeconomic status (SES) is correlated with social capital, and suggests that the social networks in disadvantaged populations, such as low-SES groups, typically offer fewer opportunities for life advancement [13,21,40,45]. For example, research has demonstrated that SES is significantly correlated with social support, and social trust in one's networks: low-SES individuals were found to have less of these forms of social capital than their higher-SES counterparts [21].

Therefore, to empower communities and individuals in resource-poor settings, there is a vital need for innovations that build social capital. Prior research has explored how information and communication technologies (ICTs) can enhance social capital [8]. For example, Facebook usage has been found to lower the costs of maintaining a wide and more heterogeneous network [15]. The maintenance of such networks is associated with benefits such as access to relevant, diverse, and previously inaccessible information and opportunities such as job openings. In another study, researchers found a positive relationship between Facebook use and social capital constructs including social trust, civic engagement, and political participation [49]. Recent studies have also examined how technology can foster social capital amongst vulnerable populations [12], highlighting the need for tools that connect people to more diverse social ties (with richer resources) and broaden their networks.

ICTs present great opportunities for increasing social capital [53]. However, in our research, we argue that innovations designed to empower populations should support the development of social capital *in conjunction with* additional factors that contribute to empowerment. In fact, studies have shown that social capital alone is insufficient for empowerment in resource-poor settings, and that other resources are also needed, such as financial capital and human capital (skills, knowledge, abilities and experiences possessed by an individual).

This prior work motivated our qualitative study of a community-based organization that seeks to catalyze the development of multiple forms of capital within low-SES neighborhoods. While many community programs work in isolation, the organization we studied connects residents to local resources as a step towards eradicating poverty. The main mission of the organization is to enhance community engagement and build collaborative ties between community members. One of the key features of this organization is its recognition of community members' participation in community programming by rewarding them through incentives such as gift cards, thus supplanting social capital with *financial capital* (i.e., monetary resources). This way, participants understand the value of social capital as it translates to something palpable.

The core mechanism of this organization is a mobile web application that lists various events occurring in local neighborhoods. Using the app, members can view events and receive points after using the app's check-in feature to register their participation in those events. Participants can later redeem points for tangible rewards such as school supplies or shoes that members can get from specific stores. Therefore, the point system functions similarly to a *loyalty program*; in the marketing world, such programs encourage customers (in our case community members) to frequently use a service (in this case services and opportunities within the community).

We conducted semi-structured interviews with 13 community members to understand the inner-workings of this organization, how and why people engaged with it, and the value and challenges it presented for its members. The research questions guiding this work are: **RQ1:** *How can social, organizational, and technological supports work in tandem to catalyze community engagement?* **RQ2**: *How can such socio-technical systems leverage community engagement as a way of fostering empowerment in low-SES communities?*

Our findings highlight how the community engagement that was catalyzed within the organization appeared to foster the various forms of capital building critical for empowerment. Our findings also point out the rich sociotechnical context through which residents developed not only social, but also financial, and human capital. We characterize the interplay of each form of capital that emerged as participants engaged with the community-based rewards program. We found that the simple design of the application, which leaves little room for customization, in concert with participants' lifestyles helped them discover new connections. We show how the combination of online and offline features of the program contributed to social capital building, where these features fell short, and discuss how the application could be enhanced to better support the deployment of social capital. We further analyze the interplay of the different forms of capital building processes that help residents build *family capital*. Through our discussion, we characterize how these capital building processes appeared to be instrumental mechanisms through which the organization contributed to individual and community empowerment.

We lastly discuss implications for the design of interventions to support community engagement, including how such interventions could be designed to support serendipity as a positive byproduct of simple interface design. We further discuss the importance of creating ICTs that take a family-based approach to empowerment, and which focus on *holistic capital building* (jointly nurturing multiple forms of capital).

Our findings extend an existing community informatics (CI) framework that characterizes how ICTs can help community residents engage with one another in innovative and beneficial ways [44]. Among other factors, Lyn Simpson's [44] CI framework characterizes the importance of building social capital for the sustainability of CI interventions. We enrich this framework by explicitly discussing the importance of not only social capital, but also financial and human capital for creating impactful ICTs in community contexts. Our findings and design implications can help drive future research on the sociotechnical context of capital and empowerment building within low-SES communities.

2 RELATED WORK

One crucial way of empowering individuals and communities is by helping them build various forms of capital [54]. In fact, with the growing penetration of ICTs in low-SES communities [47], technology (such as smartphones) presents exciting opportunities for helping people build capital as a means of achieving individual and community empowerment.

For example, much of the research on *civic technology* (platforms that stimulate people's engagement with matters of public and community interest [19,32]) has explored the ways in which technology can help people build and access social capital [12,27,38,44]. Many of these studies contend that connecting with other individuals online can help people access relevant resources [23]. This work has further examined how different factors influence the building of social capital [5]. For example, research has explored how various SNAs support the building of different types of social capital (e.g., *bonding*—links between like-minded individuals that contribute to strong ties and *bridging*—links between heterogeneous groups that contribute to weak tie formation) [6]. In one study, researchers examined how social presence, as an aspect of video-mediated communication, can help people build bonding social capital [36] and enhances group communication even for non-collocated individuals in rural settings [41].

Researchers have also investigated how technology can develop human capital, for example, by helping people access knowledge and acquire skills. Pervasive sources of information on the web such as www.coursera.com and videos posted on YouTube have enabled the development of human capital by allowing

people to access knowledge in different areas of interest [1,2]. Furthermore, recent technologies such as crowdsourcing and sharing economy platforms have created opportunities for building financial capital among low-income populations [12]. For example, results from a study among Indian users of Mechanical Turk show that a third of this population relies on their income from Turking for basic needs [55]. In Table 1, we overview the various forms of capitals that were examined in our study, and how they apply to our findings.

Our research investigates a community organization that empowers individuals by addressing poverty in local neighborhoods by mobilizing community residents' engagement with local resources for personal, family, and neighborhood capacity building. In this way, our work fits within the domain of *civic technology*, that is, research that explores "how technology shapes, how we govern, organize, serve, and identify matters of concern for communities" [6]. In the context of this definition, the organization we studied takes a sociotechnical approach to supporting community organizing and the provision of needed services to residents.

Table 1. An overview of various forms of capital, and their application to our research.

Capital Form	Definition	Capital Building in Our Study
Human Capital	Human Capital refers to a set of personal attributes, which form one's ability to perform in society. This form of capital includes the capabilities, knowledge, skills, experiences, training and expertise acquired by an individual [20].	Human capital is developed and supported in our organization in several ways, for example: - Expanding members' experiences by supporting resource discovery - Improving individual's' skills, social capabilities, and knowledge by catalyzing involvement in classes and community events, - Supporting personal enrichment - Providing support for life change, and - Creating a sense of Accomplishment.
Financial Capital	Financial capital refers to a set of inputs and actions resulting in the production of more economic value/financial gain over a period of time [53].	The organization we studied contributes to financial capital through the reward system. Members earn money (financial gain) by spending time and energy to attend events. They bring their time and energy to the system as inputs, collect points and gain back profit.
Social Capital	Social capital refers to social relations that produce mutual benefits for people. Social capital includes social networks, trust, social norms (e.g. reciprocity), bonding and bridging relations that have productive benefits [39]	Bridging social capital is supported by helping people discover new social connections. The organization also form a trust-based social network between members and Community Champions, which facilitates connections to Resources.
Family Capital	Family capital refers to the resources and means in a family that can influence the future of children and improve family relations [19].	Family capital building is encouraged by supporting members' family-oriented goals. The organization acknowledges individuals' role as a family member, and encourages interaction within family. The program also trains people how to interact more effectively with their children by holding workshops.

While technology presents opportunities for building different forms of capital, civic technology is often explored in terms of how it can help neighborhoods build social capital [13,22]. For example, Wellman *et al.* explored how the Internet could increase social capital and community engagement [51], and illustrated the role of the Internet in residents' empowerment in a small town [56]. Masden *et al.* [33] also presented a social media system to support neighbors' communications and examined how it impacted social capital within the community.

However, prior work shows that social capital building alone is insufficient for supporting empowerment, particularly in low-SES populations [28] This work has shown the value of a more holistic view on the capital building which takes into account social capital, financial capital and human capital [28]. However, researchers have not explored the mediating role of technology in the development of such *holistic capital*, that is, how it can further this joint capital building. We further examine how these various forms of capital are important for facilitating important outcomes for community residents and their engagement with the technology.

Within CSCW and related fields, a rich body of research has explored the domain of Community Informatics (CI), in which ICTs and supporting infrastructures provide "community activists, policy-makers and citizens a new set of possibilities for fostering social cohesion, strengthening neighborhood ties, overcoming cultural isolation and combating social exclusion and deprivation" [26]. CI research has examined a broad set of topics, such as how technology can help dispersed community members stay connected to what is happening in their home town and how ICTs can help residents collectively develop capacity and address shared problems [5,57]. Our research falls within the domain of CI, as the organization we studied takes a sociotechnical approach to invigorating and building capacity to overcome the "poverty trap" within low-SES communities (i.e., when social and economic conditions make it difficult for individuals to emerge from poverty [11]).

Our case study helps illuminate the sociotechnical context of holistic capital building. We present findings to propose areas of inquiry for future work that examines holistic capital building through civic technology. We show why focusing on civic technology as a path to social capital *only* is likely to be less effective (because the other forms of capital are needed for successfully empowering people long-term and for engaging people in the first place). We also build on Toyama's [48] argument that technology cannot fix social issues in and of itself. In fact, in the book, *Geek Heresy,* Toyama states that technology *"amplifies preexisting differences in wealth and achievement"* [48]. He argues that beyond studying the affordances of technology, understanding the human forces work in concert with technology to achieve social change goals. Toyama's argument further motivates our study of the socio-technical processes that impacted our participants' engagement with the organization and technology we studied.

3 METHOD

Given that residents of low-income neighborhoods face extensive barriers to wellness (e.g., limited financial resources and access to tangible goods such as healthy foods), there is a need for innovations that facilitate access to and utilization of resources for overcoming these barriers, thereby empowering individuals and communities. As an initial exploration of how technology could provide such support, we conducted a study to evaluate the impact of, and engagement with, a community organization that connects low-income residents to local resources.

3.1 Organization & Mobile Application Overview

We chose to study this organization because despite being recently established, it rapidly achieved high community participation—amassing over 500 members in one and a half years. This success made the organization an excellent case study for understanding how technology and socio-organizational processes can work in tandem to support community engagement, and ultimately, empowerment.

Community residents who become members of the organization use a mobile phone-optimized web application (app) that allows participants to see and check-in to community events (Figure 1). The app also

allows members to record their participation in unlisted activities that qualify for rewards. For such activities, the organization's leadership (staff and lay leaders) determine the allocated point value, assessing whether the activities are within the scope of the organizations' mission statement. The events that members participated in ranged from skill-based workshops and reading to their child, to motivational lectures and family fitness events. Members who attend these events use the app to "check-in", uploading a picture of themselves at the venue and submitting a brief description of their activities at that event. This step is essential to validate their attendance at the venue, including events that were not listed on the application. Figure 1 illustrates some of the application's user interface. Most participants in the program had access to smartphones. However, since the application was implemented as a web application, members who did not have access to smartphones could use personal computers to access the app. Moreover, members also had the option to email the events they had attended to staff members or even document their event participation using pen and paper.

Members of this community are also given a physical pin with the organization's logo. Members wear this pin to events to identify and network with other members belonging to this organization. In fact, members ensure that this pin is clearly visible in the photographs they upload during the application check-in process, which helps them gain extra reward points.

Finally, members accrue points through their regular engagement with community events (as recorded by their "check-ins"). Points are allocated to motivate members to attend as many events as possible and stay connected to local communities and other members. These points could then be redeemed for rewards such as VISA gift cards.
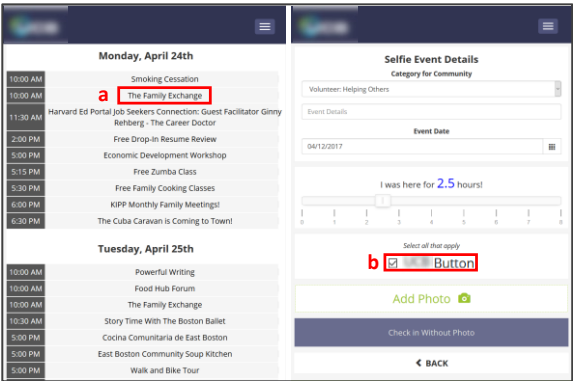

Figure 1. Screenshots of the mobile application (the currently-available version, which has undergone some minor cosmetic design changes since the time of the study.). On the Left, the event listing screen displays a chronological list of upcoming events such as family-focused programming (a). On the Right, the Check-in page is displayed. Organization members use this page to record their attendance at events—this check-in process is crucial for obtaining points. The checkbox in the check-in page (b) indicates whether a member wore the organization's pin at the event.

It is worthwhile to note that the application can be viewed as an attempt to gamify civic engagement in low-income communities. Yu Chi Chau's Octalysis Gamification Framework [5], helps elucidate the gamified elements of the application. For instance, *empowerment* and *ownership* are two elements in this framework. In games such as Monopoly, the collected cash can be used to invest in more assets that strengthen a player's position. In this case, players "own" the assets and are also "empowered" with more options to play the game. Similarly, members are awarded points when they attend community events. "Ownership" of these points "empowers" community members to acquire financial rewards to acquire resources.

Also in the gamification framework, "social influence" defines cooperation and competition between players. Often in multiplayer games, players belonging to same group identify themselves with shared symbols and names. Finally, members can progress to higher levels of membership through participation in the organization, which is tantamount to "accomplishment" in gamification framework—the equivalent of

achieving micro-goals and succeeding in challenges. The organization utilizes these gamification strategies to increase member participation in the community events.

3.2 Participants

We conducted interviews with 13 members of this organization, in a major metropolitan region of the Northeastern United States. All 13 participants were female. One reason for this gender skew could be that at the time of this study, the clear majority (89%) of organization members were women. The age range of the participants was between 35 to 55 years with an average age of 45 years. Seven community members were active with the organization for the past year, five members were active for less than six months, and one member was active for two weeks. All participants had a minimum of some high school education. One participant had a Master's degree, three participants had a Bachelor's degree, four had an Associate's college degree, three had attended some college, and two participants had completed some high school. Of our 13 participants, three identified themselves as Champion Members—individuals with an elevated status in the organization, who contribute to decision making and community organizing.

3.3 Data Collection

Interviews were conducted at our University and a partner organization's office space. Interviews were carried out as part of a graduate level HCI course. All the students who were enrolled in the class were formally trained in conducting interviews. Semi-structured interviews with participants included open-ended questions on their application usage, their participation within the community, their motivations to join the organization, and how the use of the application helped them to organize and use local resources. Each interview lasted around 20-60 minutes with average interview length of 32 minutes, and was audio-recorded and professionally transcribed. In lieu of traditional monetary incentives, participants received reward points from the organization for engaging in the interview.

3.4 Analysis

Our research team conducted an inductive analysis of the interview data, inspired by grounded theory [10]. Our team consisted of a faculty advisor with over a decade of qualitative data analysis experience, a lead doctoral student researcher, and two doctoral graduate assistants from the course. First, we performed open coding on a subset of the interview transcripts. The raw data from these transcripts were converted into emerging themes as the researchers inductively created codes to describe concepts. These themes were documented in the form of a codebook, which consisted of a theme definition and coding rubric for that theme. Once the researchers agreed on the open codes generated from the first set of transcripts, they used these codes to deductively code the remaining interviews. Each interview was coded by the lead student researcher and additionally by either of the two student researchers, under the supervision of the faculty researcher. The research team then reconciled codes during a series of meetings to reach consensus.

4 RESULTS

Our findings characterize how the mobile application and various social and organizational mechanisms supported the development of human, financial, and social capital. In the following sections, we discuss ways in which this capital building took place as members became more engaged within their community (RQ1). We further discuss how the sociotechnical system acts as a gateway for members—sparking their engagement with various social, informational, financial, and instrumental resources, how residents built upon these sparks, and the challenges they faced (RQ1). Our findings also characterize members' motivations for engaging with the community as a means of building capital, and the outcome of these processes (RQ2). The findings from our case study illuminate various ways in which technical, organizational, and social processes can work together to support community engagement, and empowerment in neighborhood contexts (RQ1,2).

4.1 Human Capital

Human capital is an intangible form of capital, which includes the capabilities, knowledge, skills, and expertise acquired by an individual [5, 21]. Human capital has a role in an individual's economic development and increases their freedom, contributing to individual empowerment. Furthermore, the accumulation of human capital encourages civic engagement and social participation [29]. As people develop human capital, they develop an increased sense of their contribution to the society, thereby empowering them to be more involved with the community [15]. In this section, we discuss how human capital was supported through mechanisms enabling resource discovery, incentivizing the use of these resources, and supporting personal enrichment and life changes. We conclude with a discussion of the sense of accomplishment derived from this process.

4.1.1 Supporting Resource Discovery. The main feature of the web application is the promotion of various events happening in the community—a regularly updated list enables the initial discovery of community resources. Participants reported that being involved in the organization has helped them to become familiar with local resources, such as new organizations in their neighborhood or local skill workshops. Most participants said that the listing of various events in the application has helped make those resources *visible* to them. For instance, P7 appreciates:

"*The things that I'm able to find out about in the community that I wouldn't necessarily have access to on my own. And lots of opportunities for, to do things with, with the children. I'm not from [this city]. So it helps me to kind of get to know the city and the opportunities around. It's been helpful.*"

P11 discussed the types of resources she can learn about through the organization:

"*I feel [the organization] like has been helpful in just me knowing what kind of workshops, like home ownership, financial planning, things like that are offered, so that I can look at my schedule and even see if I can schedule that stuff in there. Versus before I was all, I didn't really even know how to find those things. So I like [the program] for that. That it's helping like, it was very personal with regards to just being able to access different resources.*"

Our participants help characterize the great disconnect that exists in many vulnerable communities—whereby resources exist to help individuals improve their life situations, yet these resources remain invisible to residents due to the lack of awareness. This fundamental disconnect impedes the ability of community organizations in helping to foster individual empowerment. Some participants discussed how the initial exposure afforded by the application lead to a ripple effect in their resource discovery process. Specifically, opportunities promoted in the application served as *intermediary resources* through which participants discovered additional new resources. For example, P7 mentions the process she followed:

"*I was just looking for something to do on Wednesday. But being a part of and going to that Wednesday playgroup led me to, um, being able to do summer programming with this organization. Being able to continue, through the fall.*"

P9 also discussed this process, saying that through this application she was connected to things such as:

"*Motivation talks. Things that make you think of some things [...] I enjoyed that. And then as I go in the library for different talks and stuff they have a lot of posters outside of the library, and you wouldn't even have saw it if you hadn't been there. And you say, "Wow, I could, okay, let me deal with this." But you was there, so you saw it. So it's very, it's helpful with that. I enjoy that.*"

As such, the application served as a gateway through which community members could seamlessly explore more opportunities. The application was the spark and partner organizations—whose programs were listed in the app—provided the fuel to further connect community residents to valuable resources for knowledge, skill, personal, and community development.

4.1.2 Catalyzing Involvement. In addition to facilitating the resource discovery process directly (online, through the app) and indirectly (offline, through opportunities uncovered as people participated in events promoted through the app), participants highlight the incentive system as a source of motivation. Indeed, most participants felt that seeing their points go up in the application inspired them to engage more. For example, P4 said:

"*So when you look at the screen it does show you. You're like, "Oh, I want my numbers to increase." And then you're like, "Okay, what other activities?" So I like it. I like the points there. It's a motivation to keep going.*"

As further evidence of the incentive system's motivational appeal, some participants described how the point system encouraged them to go outside of their comfort zone and try new things. For example, P2 discussed how her desire to get more points pushed her to attend an event she would not have attended otherwise:

"*That was something I probably wouldn't want to go to. But I said, "You know, let me go so I can keep racking [up] my points and I learned a lot from that.*"

When asked how the application helps achieve the goals, P7 said:

"*It puts me in places I wouldn't necessarily be. It, um. helps to motivate me to do things that, that are kind of outside of my comfort zone. Even being a part of this is not comfortable. So um, not in a bad way. It's just not, not not who I am. But [...] it helps to take me out of where I'm comfortable and gives me a place to grow and to learn.*"

This process of going outside of one's comfort zone is an important step towards expanding human capital, as individuals are exposed to new experiences and opportunities that can build skills and knowledge. One reason for this sense of openness to new experiences may be that participants' lifestyles were conducive to such exploration. For example, participants described how approaching retirement or being single meant they had the time and flexibility to be more active in the community.

4.1.3 Personal Enrichment. As participants discovered new resources and were incentivized to explore new opportunities, we now discuss how personal enrichment was one outcome of this process of human capital development. Participants first discussed the enrichment they experienced as they connected to more organizations. Most described how they could build skill sets and learn new things. For example, they discussed how they participated in programs that helped them acquire new money management skills and learn to communicate better with their family members. For example, P11 mentioned that the program has helped her to learn about financial planning:

"*The financial planning. I have a really bad spending habit. Um, so the financial planning, reducing my debt, you know, getting into a place where I can eventually buy a house and things like that.*"

P4 also described how she could learn about nutrition through the organization:

"*[...] they had a shopping [event] where someone would teach you how to shop or you know, what to eat. And so you know, they focus on nutrition, family, family time.*"

Some participants equated personal enrichment from the application with personal growth. For example, P13 mentioned that:

"*I'm feeling good about being able to do something and learn and grow as a person, an individual, because there's purpose in my life.*"

For some, this feeling went beyond what the application offered to them. For example, P3 told us:

"*You know, they planted it. They planted me at [the organization]. Now I'm gonna grow into something bigger.*"

4.1.4 Support for life changes. One way in which participants used the application for growth is through the support for major life changes. Life changes included periods in their lives such as retirement and being laid off. Participants thought that being involved in the community could keep them stay busy even after they lose or quit their job. For instance, P2 said:

"*Every year around this time, right before Christmas [...] There's a huge lay-off. It never fails, always. Always. A huge population gets laid off, so more people get depressed [...] the lights, the gas, everything goes up. You know, Christmas comes around. Our population gets laid off. People get depressed, but you won't have to if you're a part of a group that's constantly keeping you out of the house.*"

This finding resonates with prior work in which researchers have also developed technologies to prevent seniors from isolation. For example, Odom *et al.* [37] designed a drive-sharing system to encourage seniors to share drives that increases socialization, thus, reducing isolation. Similarly, by keeping members busy, the organization we studied also helps prevent isolation by promoting engagement in the community. In some

cases, participants engaged in the programming promoted by the organization to prevent problems they anticipated as they aged, such as Alzheimer's Disease and becoming overly-dependent on their children. For instance, P1 mentioned that:

"*Early [onset] of Alzheimer's and stuff that scares me. And I don't want this to fade. I like to be […] hands-on. I got to be in things. You know.*"

This same participant later added:

"*My mother always told me, "Where there's a will there's a way." And if you don't pursue it, you're gonna lose it. Alzheimer's will set in. You know, you will get forgetful.*"

Likewise, P13 highlighted being independent, yet concerned about her children:

"*Because I got, I still have a 27-year old at home that I must work with. So, if she's doing her thing, I'm sure not gonna be doing mine. Because at the end of the day when she goes and gets her own place, I still got to stay up. I still got to be surviving for [herself]. Because I try not to bother my children by, "Can I get this? Can I borrow this? Can I have it?" No, no. I've always been a go-getter. Always been independent. […] I'd rather share it then to receive it. Because a lot of people like to receive it. I don't mind receiving. I don't. But I'm, I'm a giver. I'd rather give, because it makes me feel good knowing I helped that one somebody.*"

In fact, previous research has highlighted the importance of designing technologies to support life changes such as death, divorce, birth, and retirements [34, 43]. Researchers have suggested that technology can help individuals to adapt to a *new normal* by helping them to deal with pressures introduced by such changes (such as isolation in retirement). Our interviews shed light into another way in which technology can help individuals navigate through their life changes, that is, by helping people to *go back to normal* (return to a previous state) both at an individual as well as social level. For example, on a social level, one of the members (P3) suggested that the organization could help members who were previously in jail to get integrated into the community.

"*I think we should go with men that are just getting out of jail. You know, they need, they need love too. I don't care what you went in for, let me, how can I help you now that you're out? So what's wrong with [this organization] getting into that? You know, pair them with a partner.*"

Along the same lines, members also mentioned how the program can support individuals to pursue their aspirations and help them focus on themselves again. For example, P13 expressed that she wants to get her GED:

"*I've always because it just seems like my main concern always been focused on my kids. And now it's starting to be a little bit about me.*"

These quotes illustrate how technology can help individuals to return to a previous state that used to be their "normal". We argue that further research could be beneficial to characterize how technology could facilitate such transitions.

4.1.5 Sense of accomplishment. In addition to acting as a gateway to opportunities that build individuals' skills, the check-in process and seeing their points in the app (Figure 1) served as an opportunity for people to gain a sense of accomplishment. Some participants viewed the check-in process as simply a way for them to record their activities. However, for others, recording their activities, especially when not done after an event (e.g., at the end of the day), helped them to realize their accomplishments. For example, P7 mentions that:

"*You get into a go-go-go kind of mode, but it makes me stop and think, "What did I actually do today?" Um, and, "Oh, wow, I did all of this today. That's pretty crazy. Sometimes if I'm listing multiple events. It helps me to kind of get a sense of why I'm so tired at the end of the day, but also checking to events offline.*"

In addition, some participants (e.g., P12) discussed how they appreciated being acknowledged for the day to day things that they do:

"*This for me is like a satisfaction, a satisfaction that, or you know, a high-five as a parent to do the things that I am doing with my daughter. Because we could just be sitting at home watching any random TV show that she's not learning anything from. But working a full-time job and actually have, getting time or having time to take her to the zoo or to the Children's Museum. Going here and going there. And actually like, even though that I'm tired and really exhausted, taking the time to get out of the house and go to a park and play with her. And*

this application actually recognizes it. [...] Because I understand—I think that we can get like reward for the points. But just the fact that I can see that I'm gaining points for doing positive stuff with my daughter actually makes me feel better as a parent."

Therefore, both the points as well as the checking process help participants to reflect on what they have been doing and gave them a sense of accomplishment and recognition, which goes beyond mere accumulating points. Some participants also mentioned that seeing a list of the activities they have been doing for a long period of time is another way to see what they have achieved. For example, one participant discussed how she would go back and see the different categories of activities she has done and how she thought that she should get more involved in some categories than others.

Our findings around participants' point tracking and reflecting on them, are reflective of similar practices in the broader domain of personal informatics data collection and reflection [26]. While information about topics such as health and finances have been deemed important aspects of one's life for which data can be collected and reflected upon [16], our research introduces community engagement as a novel aspect of one's life to be reflected upon. Our findings demonstrate how reflecting on this aspect of one's life can lead to a sense of accomplishment. Furthermore, we note that most life-logging applications use strategies such as visualization [16], journaling [7], or predictions around user's future behaviors [46] as ways to trigger reflection. In contrast to these research trends, the application that we studied had a simple interface, and just seeing their points and checking in at specific times (at the end of the day) helped our participants to reflect on their achievements.

4.2 Financial Capital

As previously discussed, the point system used in the app, and by the organization more generally, functions similarly to a loyalty program. As with any reward program, one of the reasons why people participate is to gain economic benefits [58]. Some participants mentioned that participating in the organization was important because it helped them create financial capital. Building financial capital refers to a set of activities resulting in the production of more value or money over a period [59]. For instance, investing time and money in one's education results greater financial gains in future as soon as the candidate is hired for a suitable job. For the organization discussed in this study, points translate into financial profit for one's community engagement; members earn money by spending time and energy to attend community-related events. When asked about the importance of rewards, P3 mentioned that:

"They're really important, especially because there's only one income coming to my house. And it's mine. I'm disabled, so um, that's extra money for me. And I really, really need that. You know, [my daughter is] getting ready for college. This is her last year of high school, so you know [...] my daughter, that's money helping her."

In another case, P2 explained how she was thinking of using her rewards to get a Visa gift card to pay off her debts:

"I'll calculate if I do this [...] and this [...], then I'll pay off this [...]. Because a friend of mine said, "Well, are you going to the store [organization's store]?" And I said, "Well, no, I didn't, I didn't get a lot of points yet to go to the store." And she said, "Well, what are you gonna do with your points?" I said, "I'm gonna pay off my Visa." She said, "You're gonna get a Visa to pay off a Visa?" And I said, "You know [...] with that money I'm gonna take my Visa and I'm gonna pay off my Visa. I told you I'm on a program. I'm gonna be debt-free." You know so I'm gonna get that Visa and pay off a Visa, you know. And she said, "Oh, I'ma save my points too." I said, "Well, if you gonna save your points, you gonna have to be out here [accruing points]."

"Because I consider myself the working poor; the working poor. We work, work, work, but we still, we don't, we're working poor. So we have to get to in these programs and we have to work it, you know. So I said, "So you gonna have to find some programs after work. You know, don't even go home. You go home you're gonna go to sleep. Just go to the program, you know." So she was like, "Yeah, uh-huh." I said, "Yeah, you got to rack up those programs, so you know, you rack up the programs. Hopefully they have a store before Christmas."

It is evident from participant responses how this program is creating financial capital for members and an accompanying sense of empowerment (having control over their personal lives by becoming debt-free). In fact, previous researchers have highlighted that savings and provision creates a sense of empowerment [35]. Furthermore, the provision of financial incentives for community engagement is likely one important reason for success of this program among our participants. In fact, our participants needed these incentives not just as monetary benefits, but also to fulfill more essential needs in their lives such as school supplies for kids, groceries from farmer's market, and buying gifts for Christmas.

4.3 Social Capital

As mentioned previously, social capital refers to the value that individuals' social relations present as a result of factors such as the composition of the network, positive norms (e.g., reciprocity), and trust [42]. Prior research has demonstrated the importance of helping low-SES populations build new connections and develop more heterogeneous networks, to increase opportunities for advancement and upward mobility [14]. In the sections that follow, we describe how participants in our study developed their social networks using the app, and challenges they faced. We further discuss how social capital building occurred not only between members, but within family units. We also examine the development of human capital, and how it was viewed by many participants as a means of developing family social capital.

4.3.1 Discovering new social connections. The organization we partnered with helps participants to connect to new people in their community, by helping them to initiate those connections. Some participants mentioned that their *organizational identity* has helped them to initiate connections with other members. For example, by seeing others wearing the organization pin at an event, members felt it was natural to start conversations with them because they have something in common. Pins are an offline component of the organization. If members wear their pin at the events and take pictures with it, they get extra points (connecting the building of social capital to the creation of financial capital). Therefore, this offline mechanism helped members connect to other members. One participant also mentioned that by wearing the pin, she felt that she is representing her identity as a member to non-members. She further felt that wearing the pin has made people outside of the organization become curious about her organizational identity. In summary, participants described how the visibility of this offline mechanism helps some to get noticed by others in a positive way.

Taking selfies at the events is another feature that makes members visible to members and non-members alike. Members are encouraged to take pictures as *they* wear their pins at the events and upload the photo when they check in. For instance, P4 mentioned that she creates new connections with other members that she does not know by asking to take pictures with them:

"*Like, I mean, if you see their card [the pin], you're like, "Let me take your picture so you can get your points." It's that connection [...] Without even knowing the person, so [...] And I think that's, um, really important. So pretty much we build relations.*"

These features also helped make members visible to non-members. For instance, P2 mentioned:

"*I think what is happening is people are now questioning, because the visibility of the pin. They're asking more questions. "What are you guys doing with the pin? What does the pin mean?" And the pin basically mean, you know, we have these group of people who are now being more concerned about their community. And getting more community involved, because a long, long time ago you couldn't get people to get community involved.*"

P2's quote also highlights an important aspect of using the pin among non-members; that is, the sense of community empowerment that was engendered by being part of the organization. However, when talking about this mechanism some members expressed discomfort around taking pictures in public. For example, P14 did not feel comfortable to take a selfie with the pin because it attracted a lot of attention, and she found it embarrassing. She said:

"*You have to take a picture and people think, you know, it's kind of like embarrassing taking a picture of whatever it is that you're doing. Because you don't know what's going on in somebody else's mind like, "Why is she taking a picture of this sign?" Things like that. So it's a little bit embarrassing on that part.*"

In terms of the types of connections participants built, some participants preferred to connect to people with common interests. For some, these interests evolved around family, kids and common activities. However, other members pointed out that they appreciated the diversity of members. For example, P13 mentioned that she wanted to see more men come to participate in the organization. She said:

"*What I want to add to the app? I want to, I want to reach more men. I want men to be a part of this, not just women.*"

This desire to meet diverse types of people suggests the promise of designing future systems that can enable bridging social capital.

4.3.2   Connecting to Resources via Community Champions. Within the organization, members can become Community Champions based on their contribution to the organization and the points that they have accumulated. Community Champions are provided with training, support and pay to engage in a range of activities: recruiting new members, helping members access community resources (e.g. partner organizations), promoting events, and partnering with local organizations (to serve as a point of contact for members). In this section, we discuss how Community Champions' position in the organization served as an important resource that could be deployed by members.

Participants described Community Champions as resourceful and reliable members that members trust. For example, in discussing one Community Champion (Mary), P2 describes Mary's ability to provide useful information and mobilize community members:

"*She (Mary) gets a lot of information and she always say, "I have this program. I have that program. Would you like to try it?" So I always say, "Yes." Because she always do the groundwork. If it's good she knows it! [...] So she's a person who [...] if they say, "Mary, I need 20 people. I need 20 liable people." She can go to her index and get 20 liable people.*"

Participants were not only able to count on Community Champions for different issues, they also expressed reciprocity by saying that Community Champions could count on them. P2 added:

"*I do whatever Mary says! Mary say, "Jump." I say, "How high?" (laughter) No, no, she's another, she's another resourceful person.*"

Therefore, by creating the Community Champion role (which introduces a hierarchy that ascribes trustworthiness to members), the organization has identified members that can be trusted, have access to valuable community resources, and to whom other members express reciprocity. Each Community Champion works as a point person for members to connect to the partner organizations, and subsequently they have gradually become rich in social capital (by getting connected to new organizations and members as part of their role) and serve as bridges between organizations, community resources and members, to help them find resources that they need.

The concept of having Community Champions, who are more resourceful and experienced, in addition to regular members, is closely related to research on legitimate peripheral participation (LPP). The concept of LPP describes how, as newcomers observe and interact with more established members, they can gradually expand their knowledge and skillset, becoming more experienced and central contributors to organizations. Our findings showed that while this process of LPP acted as an opportunity for some members by acknowledging and encouraging their involvement in the community, for others it introduced tensions. For example, for some of the members who had higher aspirations to become leaders, the fact that they had not yet become Community Champions was discouraging. For example, P3 expressed her displeasure of not having been made a Community Champion yet. After expressing her displeasure, she later mentioned:

"*But I'm gonna be much more than that. I'm gonna be, I'm gonna be a CEO of my own thing.*"

While this delay in being promoted to a Community Champion engendered some feelings of displeasure, it is interesting to see how some members were eager to grow, seek to be more involved, and would like to extend their growth even beyond their participation in the program.

Our findings show how supporting LPP through the creation of a standard member role for newcomers and the Community Champion role for more experienced members both helped the community program

and posed interesting challenges. To summarize, we showed ways in which the organization helped expose participants to new social connections.

4.4   Interconnected Capital-building and Family Capital

Thus far, we have discussed how participation in this organization facilitated various capital building processes. In this section, we highlight the relationship between these processes and demonstrate how they contribute to family capital building. It is important to note that while we illustrate ways in which the aforementioned concepts are interconnected, we do not suggest the existence of causality among them. Given our qualitative research methodology, our findings do not demonstrate correlations or causality. Instead, our findings provide a descriptive account of emergent phenomena that should be further investigated and confirmed in longitudinal, hypothesis-driven studies.

Figure 2 illustrates the interplay of various forms of capital building that were captured in our interview data, as well as one relationship that was not explicitly discussed by participants, but that we hypothesized occurred based upon the themes in our data (denoted by the dotted line). First, members perceived the financial capital created in the program as a motivation to expand the range of events they attended; they further discussed how participating in such events helped them create human capital (learn new skills). Second, in many cases, participants discussed how they felt building human capital (such as learning communication skills with children) enhanced social capital within their families. Lastly, financial capital is potentially created through members' increased knowledge about financial planning (built through participation in relevant community workshops). These joint processes of capital building appear to support the organization's success as participants gained access to multifaceted benefits.

We will now elaborate on how, for many of our participants, these interconnected processes contributed to family capital. In this study, we borrow the definition of family capital from [18], which refers to the resources and means in a family that can influence the future of children. In that sense, family capital not only refers to social capital existing in the family unit, but all aspects of the family (e.g., human capital and cultural capital such as family values) that can benefit children. Our analysis characterized the ways in which participants strongly viewed the program to not only help themselves, but also their families. For example, when asked about her personal goals in life, P2 mentioned:

"*Uh, well my personal goals in life is one, to get my son out of school. He's gonna, he's going to college this year.*"

Therefore, most of the participants viewed engagement with the organization as an investment not only for themselves, but also for their families. For example, when discussing saving and spending their rewards, they mentioned that they would use the money for their family members' college expenses, school supplies and Christmas gifts (and in this way, financial capital contributes to family capital).

The organization encourages interaction with family members; in fact, members can log time spent with family in the app and points are awarded accordingly. When seeking events, many participants reported that they looked for family-oriented programs that they could do with other family members. Other participants sought programs that help them learn how to interact more effectively with their children. For example, P7 said:

"*There was an event a few weeks ago. It was a, uh, I guess it's a workshop. Maybe, um, for families. So there were parents, grandparents, caretakers there and their children. The goal of the event was to kind of provide opportunities, for parents and caregivers to learn how to interact and play with their kids in different ways. And it's called [name of the event], and [it offered] things for the kids to do as well that are fun and interactive for them.*"

Therefore, participants engaged with the organization to enhance the quantity (time spent) and quality of their interpersonal relationships (social capital that inheres within the unit of a family) with their children, which both are aspects of family capital. Some participants revealed that the reward system encourages them by making them feel acknowledged for the time they spend with their children. This is best captured by P12, who is a single parent who used to be a teen mom:

"*It's more besides, um, helping me bond with my daughter and, um, spending my time when I do have time off and free time doing positive things. It's the sense that you get that somebody's actually noticing what you're doing.*"

Participants also discussed how participating in the program impacted how their family viewed them. For example, P1 expressed that:

"*My oldest said, "Mom, where did you go? I called you." "Oh, girl, I had something to do. I was out. I was at another meeting." She said, "Wow." So she tells her daughter, "You know, your grandmother gets out."*"

For other participants, the point system served as an encouragement to become more active within their communities and be a model for their children. Another participant mentioned that being part of this organization is helping her to feel that she does not need to depend on her children and can take care of herself. Such a feeling can be considered as one of the ways in which individual empowerment (which refers to the ability to control one's life) is manifested within the context of the family.

In summary, our findings characterize how a simple app worked in tandem with offline mechanisms to build various forms of capital for our participants. Our results also highlight the interaction between human, financial and social capital in a dynamic eco-system, and how participants' families are impacted by this interaction. In the remainder of this paper, we discuss several design implications that derived from our findings, to inform the creation of effective Community Informatics initiatives in local communities.

5 DISCUSSION

Within CSCW and related fields, a rich body of research has explored the domain of Community Informatics (CI), in which ICTs and supporting infrastructures provide "community activists, policy-makers and citizens a new set of possibilities for fostering social cohesion, strengthening neighborhood ties, overcoming cultural isolation and combating social exclusion and deprivation". CI research has examined a broad set of topics, such as how technology can help dispersed community members stay connected to what is happening in their home town and how ICTs can help residents collectively develop capacity and address shared problems [5,57]. Our research falls within the domain of CI, as the organization we studied takes a sociotechnical approach to invigorating and building capacity to overcome the "poverty trap" within low-SES communities (i.e., when social and economic conditions make it difficult for individuals to emerge from poverty [11]). As we have discussed, to help residents escape poverty, the organization uses an app, together with socio-organizational structures (e.g., a tangible rewards system, pins for creating member unity and promoting the organization, and the Community Champion role), to encourage engagement with local resources (e.g., for personal and family development) and increased social connections amongst residents.

Prior research has discussed the importance of social infrastructure and social capital for creating sustainable CI initiatives. For example, Lyn Simpson [44] developed a framework characterizing the relationship between building social capital and the effective implementation of CI initiatives. Simpson's framework highlights the importance of CI initiatives assessing and building upon the existing levels of social capital in a neighborhood (e.g., levels of trust, reciprocity and shared values). By assessing initial levels of social capital, CI interventions can be tailored to the needs of a community, augmenting strengths and helping ameliorate challenges that may exist.

While Lyn's framework provides a useful characterization of the value of CI initiatives addressing social capital, it does not detail the importance of CI interventions creating other forms of capital to support the wellbeing of residents (e.g., financial, human, and family capital). Our findings help shed light on the value of community-based technologies that go beyond supporting social capital, to supporting holistic capital building (i.e., the joint creation of human, social, family, and financial capital). Through the creation of these various forms of capital, the organization we studied catalyzed individual and community empowerment [24]—helping individual members gain more control over their lives through increased access to resources for personal and family betterment, and helping the community gain control of its wellbeing through

community-driven leadership structures and transformed conditions in which organizations and residents are more effectively connected. Further, by describing how these various forms of capital building were interconnected in the organization we studied, we show how a holistic capital building approach within CI can create multifaceted benefits for community residents.

In the remainder of this paper, we build upon Simpson's framework, using our findings to discuss opportunities for sociotechnical systems to support social infrastructure and social capital. We then extend her framework to discuss the importance of serendipity, a family orientation, and holistic capital building in CI interventions.

5.1 Encouraging Serendipity

One aspect of the application we studied was particularly noteworthy: it had a very simple interface. The primary functions of the application are to provide organization members with a list of events, and to allow them to check into those events. Many participants felt the application could be improved by allowing them to customize the event list to their own needs (e.g., by sending alerts about family-based events). However, we argue that not having this feature, in combination with the incentive system, helped participants to discover new events and new resources. In fact, most technologies and information systems are developed to create a more personalized user experience. However, in a CI setting, one unintended consequence of personalization could be a diminishing discoverability of new resources and information.

One closely related phenomena that has risen around information seeking in social networking applications is the concept of echo chambers. Echo chambers are defined as networks in which individuals are only exposed to like-minded ideas. It has been argued that personalization and the composition of people's networks (and hence the kinds of information they are exposed to) are some factors that have created such chambers online [3]. As people actively personalize the kinds of information they receive online (e.g., via news aggregators) and passively have that content tailored to them (e.g., through algorithms that filter information in social media feeds), they receive tailored yet arguably narrowly-focused (i.e., less diverse) information [3]. Therefore, it is now more difficult for users to find information they need, but do not realize they need. Hence, the support of serendipity—helping people find valuable information that they did not realize they desired or needed—could help users to connect to useful people, connections and resources. In fact, researchers have argued that information systems should encourage curiosity and exploration [60]. Makri et al. [61] classified existing technologies that support serendipity into three major categories: 1) recommendation systems to suggest content that users might not otherwise have looked at, 2) location-based recommendation systems for mobile platforms, which suggest near-by events and places, and 3) and information visualization to help users make new discoveries (e.g. exploring book collections by using interactive visualizations).

In our study, we found that the app supported serendipity by helping members discover unexpected information about community resources, as opposed to the kinds of information that could surface from more goal-directed and personalized search. Without the ability to filter the event listings, our participants were exposed to a variety of new resources. In a related research project [17], Forsblom et al. attempted to stimulate serendipity for users of a mobile application that recommended music festival events. The authors experimented with algorithms that randomly recommend events regardless of the proximity of event. Their findings highlight the tradeoffs between connecting users to information based on their expressed interests and expanding their exposure to information through the presentation of unexpected content. In other words, when users were able to find unexpected content (in the case of the study, musical events), they did not find the content interesting. An important area for future inquiry is how CI systems can achieve a balance between exposing people to unexpected community engagement opportunities that match their interests.

Of course, search and filtering are important means of mining large data stores, and people often have specific needs they need met (e.g., identifying classes to support financial literacy when one is facing large

amounts of debt). These realities mean that completely unstructured and non-searchable lists are not realistic. However, we do suggest that future research experiment with ways of minimizing excessive personalization in CI tools that seek to catalyze resident engagement with local resources. Strategies are needed that both help residents connect to the local resources that most meet their self-identified needs, but that also expose them to opportunities they could not have predicted to be beneficial.

While our work has focused primarily on the topic of connecting residents with resources, this concept of serendipity applies to CI design more broadly. Within the context of technologies that provide supports that range from community organizing for social change to establishing stronger social ties amongst neighbors, there is a danger of technologies prematurely limiting residents' exposure to new opportunities for community engagement. For example, through well-intentioned efforts to connect residents to others that a system predicts will be a good match for relationship building (as we suggested in the previous section), the system could preempt relationship-building amongst residents who are surprisingly well-suited to provide social support to one another.

5.2 Family-based Empowerment

Our findings showed that much of our participants' motivations for engaging with the organization stemmed from a desire to uplift not only themselves but also their families. Participants achieved this goal through the utilization of resources that help them contribute to their families and through direct participation in local events with their families.

As such, we argue that shifting the focus of CI design from individuals to the family unit, could have many benefits. First, a family focus could better reflect the use of technology among low-income populations. For instance, one study showed that sharing computers and cell phones is more likely to happen among members of low-SES families as compared to high-SES families [52]. Moreover, by shifting our approach to family units, the processes of family capital building that emerged in our study could be leveraged for further engagement of family members who are not directly part of such community organizations. In fact, one challenge in community development, which was recognized by the organization we studied, is the low participation of males within communities [62]. For example, the application we studied could introduce new layers of users, for example, primary users and secondary users who do not use the application directly, but who get updates about their family members. This layered approach would allow for direct and indirect engagement with the community, providing secondary users with a greater awareness of their family member's engagement. This awareness could allow family members to provide positive affirmation to the primary users of the application, as a means of further spurring them on in their community engagement. Furthermore, as secondary users gain increased understanding of what their family members do in the community, it could help facilitate a form of legitimate peripheral participation [30] whereby supporting users can gradually develop the self-efficacy and motivation to be engaged in the community themselves. This process of LPP and the provision of social support offer important opportunities for empowering families. Future research should explore how to design family-centered CI systems, investigating the ways in which family members can positively influence one another through such tools.

5.3 Towards Holistic Capital Building

While CI research often focuses on social capital as a desired outcome, we argue that there is a critical need for a more holistic orientation to creating and evaluating CI systems. Indeed, empowerment occurs not through the creation of social capital isolation, but by helping people develop their skills, knowledge, abilities, and economic resources, in conjunction with their social relationships. Future research should explore how CI systems can help people to achieve these joint goals.

For example, when considering the creation of systems that support activism for social change in neighborhoods, special care could be taken to not only provide instrumental support for mobilizing and connecting collectives (social capital), but also for helping residents develop important leadership and project management skills (human capital). These skills would be practically useful for taking social action against local injustice, but could also be useful for people more broadly, for example, as they seek improved employment or education opportunities. Alternatively, software aimed at facilitating neighborhood social cohesion could seek to develop computer-mediated communication that builds stronger bonds within families (family capital) and between families (social capital). Following the model of the organization we studied, CI researchers should explore collaborations with community organizations to examine how CI systems can facilitate innovative ways of building financial capital together with other forms of capital. Indeed, embedding CI systems within the rich socio-organizational infrastructure of community institutions is crucial for holistic capital building. Future research should examine the benefits and challenges that arise in the context of such sociotechnical systems.

6 CONCLUSION

We contribute to CSCW research by introducing new opportunities for community informatics systems that focus on the interrelationship between different forms of capital. Our findings suggest that the organization we partnered with created a sustainable sociotechnical eco-system in which human, financial, and social capital were built and translated into individual and community empowerment. In this eco-system, various factors contributed to the success of the program: the visibility and discoverability of novel programmatic and social resources (through online and offline features of this program) acted as an enabler for capital building; the point system, rewards and accompanying sense of accomplishment served as motivators; the personal and family enrichment and support for life change made participation valuable; and members' lifestyles served as a contextual environment that further made community engagement possible. We recommend that future work explore how community informatics systems can further enable holistic capital building by supporting serendipity and a family orientation.

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