1. Introduction

The desire for privacy is often presented as being in tension with the desire to use technology for connecting and self-disclosing—that prioritizing one, means loosing the opportunity for the other. For example, after hackers leaked private photos several female celebrities had taken to connect with spouses and significant others, some suggested that once any information is digitized there can no longer be any expectation of privacy [53]. Sometimes disclosure is required by the policies of the social network, such as recently when Facebook moved to delete all accounts created under pseudonyms or anonymously [8]. Previous empirical work on the topic alludes to two common practices around this perceived dichotomy. One is to prioritize privacy over active online participation, by disengaging from online communities—indeed, concerns about privacy correlate with less participation online [51]. The other is to prioritize the social connections that can be gleaned in online communities while accepting the loss of privacy, commonly with an allusion to the idea that “an honest [person] has nothing to fear” [14]. However, online communities for recovery from addiction and alcoholism can offer a new perspective on this dichotomy—a context where lives depend on finding a balance that neither sacrifices privacy nor active engagement.

People who are recovering from addiction and alcoholism rely on forming and engaging in mutual-help support communities in order to stay clean and sober [22]. Privacy is of utmost importance in these communities, as there is significant social stigma associated with substance abuse disorders and many recovering persons are reconstructing a life after years of antisocial behavior [16]. In face-to-face communities, these two priorities have been negotiated through the social principle of “anonymity,” which includes not only protecting individual privacy, but also protecting the group, and creating an atmosphere of equality [58]. However, online true anonymity may be hard or impossible to achieve [31] and recovery groups must consider new practices and shifting dynamics introduced by technology [63]. Online recovery communities offer a context where both the priorities of privacy and anonymity and the priority of engaging to form strong tie support networks are essential high-stakes part of everyday life and must be negotiated both at the individual and at the group levels. Investigating these types of communities can provide a new perspective on two related sociotechnical topics that are of interest to Social Computing. These topics serve as the basis for the research questions that drive the proposed investigation:

1. Interpretations and Practices around Anonymity Online: How do individuals interpret the idea of anonymity and enact it through practices in online communities? How do online groups manage engagement and enforce social norms while enacting the practices of anonymity?
2. Online Strong Tie Support Networks: How do individuals form and maintain strong tie support networks in online communities? What is the role of different communication technologies in this process?

Issues of privacy, anonymity, equality of participation, engagement, social support, and strong tie relationships are of interest in many online social network contexts. Online recovery communities provide a unique opportunity to investigate these questions with people who are highly sensitized to these issues, have likely spent considerable time discussing these questions in other contexts (e.g., tradition meetings, group conscience meetings, service meetings, and conventions), and will be able to add a new perspective to the ongoing discourse.

In this investigation, Dr. Yarosh proposes exploring sociotechnical practices around anonymity and support in the context of online recovery communities through a series of empirical and design inquiries. The goals of the proposed investigations are twofold:

- Dr. Yarosh’s intellectual merit objective is to build understanding of the relationship between people and technology by contributing to two related core Social Computing open problems: enacting anonymity online and managing strong tie support in online communities.
- Dr. Yarosh’s broader impact objective is to collaborate with the recovery community and research organizations to design technology that may help address the “treatment gap” for addicts and alcoholics who seek recovery.
Dr. Yarosh will accomplish these objectives by undertaking two synergistic lines of inquiry. The empirical line of inquiry will focus on a mixed methods investigation of an active online recovery community that will integrate evidence from participant observations, quantitative data of user activity scraped from the intherooms.com website, and two sets of in-depth interviews with online community members. Finding from this empirical line of inquiry, as well as Dr. Yarosh’s previous investigations of sociotechnical practices in face-to-face recovery [63], will serve to inform the design line of inquiry. The design inquiry will focus on forging partnerships with the local recovery community and leveraging this dialog through a cooperative inquiry approach to validate the empirical research insights and prototype new technologies to embody the findings of the empirical investigation.

In addition, to the immediate goals of this work, these investigation will serve as a basis for an independent program that will help position Dr. Yarosh to contribute to Social Computing and Personal Health Informatics research communities in the future. The proposed project will allow her to acquire preliminary data from a thriving online recovery community, develop collaborations with the recovery research community and local recovery organizations, and will support her in developing new prototypes that will serve as the basis for her future competitive proposals in the field. In the following sections, the PI describes the specific context and contributions of this project and proposed plan for completing this work.

2. Research Context: Online Recovery from Addiction
While supporting recovery from addiction is the context, not the main contribution of the proposed work, it is necessary to understand this background to see how this unique community can speak to core Social Computing problems and the potential broader impact of work in this area.

Substance Abuse Disorders
Substance use disorders are characterized by needing increasing amounts of a chemical substance to achieve desired effect and persistent unsuccessful attempts to cut down or stop use despite increasingly severe consequences to the user. These disorders are a medical condition which is estimated to cost the United States $374 billion per year [67]. Estimates show that 67% of Americans drink alcohol, with 11.9% developing dependence to the substance; 45.8% of Americans try illicit substances during their lifetime, with rates of dependence between 10.3% and 67.8%, depending on the substance [49]. Immediate treatments for substance abuse involve medical intervention such as detox and rehabilitation therapy, but are rarely effective in the long-term unless paired with a maintenance program [49].

Twelve-Step Communities
The most common type of maintenance program is the twelve-step approach, such as Alcoholics Anonymous (AA) and Narcotics Anonymous (NA). Various investigations have shown twelve-step interventions to be as or more effective than alternative approaches and they are frequently the intervention recommended by the medical community [54]. Twelve-step programs are characterized as a social movement that “has become the prototype of a burgeoning category of mutual-help organizations” [48]. In 2012, AA service structure included 114,070 groups and NA included 58,000 groups worldwide [2,3]. Independent studies have hypothesized that these numbers may be understated since only about 50% of groups participate in the general service structure [48]. Some estimates show that as much as 3.1% of the U.S. population may be involved in AA [48]. Each AA and NAs group’s relationship to individuals and other groups is governed by the Twelve Traditions, which center on a number of “spiritual principles,” such as anonymity, equality, unity, etc. [58]. Though there have been a number of studies examining twelve-step communities from the psychological, sociological, cultural, and clinical perspectives (e.g. [10,27,36,48,54]), the role of technology in twelve-step recovery has only recently been considered from a Human-Centered Computing perspective [63]. However, this is the first investigation to examine how the traditions and social norms of twelve-step communities are enacted online, applying these findings to core problems in Social Computing research.

Online Recovery Communities
There have been a number of research investigations focusing on the potential role of information technology in expanding access to treatment and maintenance programs for recovery from substance abuse disorders. Most of these interventions fall into two categories: (1) providing the user with information and motivational ideas and (2) using the Internet purely as a medium for communication [15].

In the category of information-based interventions, a study of Internet-delivered motivational incentives as a supplement to an outpatient addiction treatment program found that those who received access to the technology were less likely to drop out or relapse while in treatment [11]. Approaches that combine computer-based interventions with professional assessment, perform better than assessment alone [42]. However, a systematic review of web-based interventions for alcohol-use reduction reported that systems that provide only informational interventions are not as effective as those that provide targeted feedback to the patient [6]. Systems that are used over a longer period of time are shown to be more effective. For example, an automated email intervention sent to participants who were trying to quit smoking was more effective than a single-point-in-time web interaction [37]. In the category of communication-based interventions, most have focused on providing textual and forum-based support [15]. One example is MedHelp alcoholism forum where participating individuals exchange asynchronous text-based communication to receive support and form a recovery community [13]. Another project which deployed a private social support forum for alcoholism recovery suggested that this kind of online interventions is “private,” “convenient,” and “immediate” [41]. Most recent work combines information- and communication-based support by extending a system that has been used for other health interventions. CHESS (Comprehensive Health Enhancement Support System) provides online Q&A repositories, bulletin board style support discussion groups, and a repository of text/video stories available for use by approved people in a facilitated environment [25]. Most recently, the NIAAA has funded the ongoing clinical trial of its use in recovery for alcoholism [24]. Most of these investigations focused on the clinical aspects of recovery in a facilitated setting, however the most common type of long-term maintenance (12-steps, as described above) focuses on the community aspects of recovery and a non-facilitated mutual-help setting. The proposed project focuses on the specific sociotechnical practices of online twelve-step communities around the concepts of anonymity and support.

The online community intheroom.com provides one opportunity to understand online practices regarding anonymity and mutual-help support. This is a public social networking site focused on connecting people in recovery, as well as those seeking to support people in recovery. It is the largest online recovery community in the world with more than 300,000 members [68]. Intherooms.com serves as the online public agora for the recovery community hosting more than 100 weekly twelve-step-style online meetings (including videochat groups). It is significantly different from the types of support provided by clinical intervention: it is freely available to all; it does not include professional facilitation; it has a larger membership than any previous intervention; its members participate in and identify with the principles of twelve-step programs, such as anonymity; and, it provides a technologically diverse ecosystems of tools for connection, rather than relying on forum-based support. The PI sees this community as an opportunity to not only investigate the specific context of recovery, but also as a source of sensitized participants who are able to discuss and articulate core topics that are of interest in other Social Computing contexts, such as enacting anonymity, forming and maintaining strong tie support networks, and group self-organization around the sociotechnical issues of privacy, enforcing social norms, and more.

3. Research Topics and Questions
As an organizing structure for the related work background and proposed contributions, this section emphasizes the specific research topics and questions that will be addressed by the proposed investigation.

Individual and Group Interpretations and Practices around Anonymity Online
In twelve-step communities, a statement is read at the beginning of every meeting that states: “anonymity is the spiritual foundation of all our traditions, ever reminding us to place principles before personalities” [58]. Interviews with AA and NA members reveal that anonymity has three main goals in these communities: to protect the individual (privacy), to protect the group (unity), and to democratize participation
First, how do individuals interpret the idea of anonymity and enact it through practices in online communities? Though privacy is but one component of anonymity, it is one of particular importance to individual participation in online communities [14,51]. The tight constraint between identity performance and social context is one of the reasons that users have trouble managing their identity online [21]. Substance disorders carry a social stigma [16] and once reputation is damaged online, it is often impossible to repair [59]. In other online settings, individuals may manage privacy by limiting sharing personal information [66] and not discussing real personal problems [43]. However, for members of recovery communities limiting self-disclosure is not a viable option, because it conflicts with primary goal of forming strong tie support networks [63]. Though it may seem that anonymity is easier to achieve online than in person because of visual anonymity [47], especially in the early years of the Internet [18], more recent work points to the inherent challenges of doing so. People want to remain anonymous online for a number of reasons [31], but find it difficult to do because of the persistence, replicability, scalability, and searchability of networked public spaces [7]. Understanding how individuals in recovery communities balance the need for privacy and the imperative to self-disclose, how they reason about and enact anonymity in their daily lives, and how technology may help (or not help) them in that endeavor can highlight policy and design issues for a number of other online communities (e.g., mothers online [62]). However, viewing privacy as but one constituent component of anonymity has important implications for decision to break anonymity. For example, the proportionality theory of privacy holds that when the benefit to the individual is high enough, privacy concerns may be viewed as less salient [29]. However, two of the other components of anonymity are relational rather than individual—decisions about individual anonymity affect the group, which leads to another important question.

Second, how do online groups manage engagement and enforce social norms while enacting the practices of anonymity? Studies of newcomers on Facebook found that social learning—seeing how others contribute—was key to how members decided to contribute themselves [9]. In face-to-face meeting, members of recovery groups maintain anonymity through social and cultural practices rather than technology [58]. However, in online settings these social conventions may be more difficult to enforce and anonymity may actually lead to “bad” behavior [4,52]. Most social computing approaches rely on the idea of persistent identity and reputation to encourage desired forms of interaction (e.g., posting good posts) and discourage undesired activities (e.g., vandalism). Identity plays an important role in online recovery communities, but could also interfere with the ability to get emotional support or accountability in times of trouble [44]. The other problem with anonymity online is that it affects how members of communities engage. On one hand, anonymity has the potential to democratize participation [46]. On the other hand, previous studies have shown that there are difference in activities and motivations between anonymous versus registered users, such as registered users being motivated more by a sense of affiliation [35]. While the twelve-step ideas of anonymity and “principles before personalities” challenge the claim that persistent identity is necessary for the health of a community, true anonymity online may conflict with the goal of forming strong support networks. Members of online recovery communities can contribute to the understanding of these tradeoffs.

Proposed Research

The research team will use multiple sources of evidence to understand how anonymity is interpreted and enacted by individuals in online recovery communities. A crawl of intherooms.com allows scraping and storing current public profile information shared by each community member, as well as contact between members that resides in the publicly-open areas of the website. Understanding what participants choose to share openly about themselves and their interaction with others will help inform the interview protocol. In-depth interviews will allow the investigators to ask specific questions about individuals’ online behaviors, interpretations of anonymity and its role in recovery, and solicit rich narrative from participants about situations when their interpretations may have conflicted with those of others or those encoded into
the mediating technology. Design workshops will also be a useful empirical tool in eliciting a discussion about balance and specific tradeoffs. In the PI’s experience, members of recovery communities are self-reflective informants, capable of articulating the tensions between hiding and revealing self. However, for these reflections to be most useful to design and practice, it helps to encourage participants to take an explicit stand on what they view as the right balance. One of the goals of the design workshops will be to support participants in this process.

To understand group interpretations and practices around anonymity, the investigators will contact leaders and trusted servants from public online meetings hosted by intherooms.com. The specific participants contacted and some of the questions raised will be influenced by preliminary participatory observations of online meetings. In-depth interviews with these participants will focus on eliciting specific examples of situations where the leaders had to reiterate social norms, such as anonymity, while leading a meeting on intherooms.com. They will be asked to share about their responses to violations of these norms, such as “trolling,” online vandalism, and disruptive behavior. Finally, they will be asked to reflect about the differences between how these processes are enacted online versus in face-to-face meetings.

**Online Strong Tie Support Networks**

Granovetter introduces the concepts of weak versus strong ties in order to explain the relative importance of each [23]. Weak ties are central for group cohesion and informational diffusion, but strong ties are bidirectional (i.e., friendships) and better predict resilience in the face of radical change [33]. Weak tie health support networks have their use in providing diverse objective information and reducing obligations [61]. However, previous research has shown that a close support network is most important to the recovering addict/alcoholic [22], perhaps because they greatly benefit from the ability to face the radical change in their lives. Unfortunately, computer mediated interaction frequently does not create the conditions for developing and maintaining strong ties [55]. For example, general-purpose social networking sites are best at maintaining weak ties rather than forming new strong ties [61]. While some technologies have been promising for fostering strong tie relationships (e.g., [1,65]), these have almost always focused on maintaining existing family relationships rather than forming new ones. Indeed, the PI’s initial work with recovery communities found that one of the biggest worries cited by participants over the role of technology in recovery centered around technology’s potential to disconnect, trading affection for efficiency [63]. This leads to two related research questions.

First, how do individuals form and maintain strong tie support networks in online communities? The four factors that define tie strength are time spent together, intimacy and mutual confiding, emotional intensity, and reciprocal services [23]. Intimacy is perhaps the most problematic of these to accomplish in online social networks. Intimacy is created in the context of an online identity, in a process that is both part of self and enacted in relation to others [5]. However, many social networking sites are places for identity management and presentation-of-self grooming, and particularly health conditions that involve social stigma are least likely to be discussed on social networking sites [12]. As relationships increasingly become mediated by communication technology [55], it is important to understand how strong ties may be formed and maintained online. Online recovery is a fruitful context to study this question. Unlike other online support groups which are frequently lightly populated and where leaving the community is frequently a positive eventual outcome [40], online recovery communities are active, built around long-term participation, and encourage forming strong relationships as an essential high-stakes part of everyday life.

Second, what role do different communication technologies play in fostering strong tie relationships? There is conflicting theoretical and empirical evidence as to what may influence the choice of the communication technology used for forming and maintaining strong tie relationships. On one hand, Media Richness and Media Synchronicity Theory suggest that a richer and synchronous medium will be selected for more emotionally nuanced and ambiguous tasks [17]. Indeed, that has seemed to be the case in mediating closeness between family members, where videochat is typically the medium of choice [32,45]. On the other hand, self-disclosure and intimacy online seem to increase from visual anonymity, suggesting that a less rich medium may be more appropriate for encouraging some strong tie interaction [5,30]. The
role of synchronicity is also unclear, as studies present evidence that self-disclosure over asynchronous video (i.e., vlogs) can be used to create emotional connection and community [38]. Many previous investigations of strongly-connected online health support communities, seems to suggest that plain text forums are adequate for the communication needs of health community [39,60]. The choice of medium for forming and maintaining strong ties online is an open question and one that can benefit from the perspective of online recovery communities.

**Proposed Research**

To understand how people form and maintain strong ties in online communities, the investigators will synergistically integrate sources of quantitative evidence from crawling intheroom.com (e.g., public space interactions between members, self-declared ties) and qualitative evidence gathered through in-depth interviews with active member of the community. The interviews will focus on eliciting personal narratives of successful and unsuccessful experience in forming and maintaining strong tie connections in this online community.

The choice of medium for forming and maintaining strong ties online is an open question and one that can benefit from the “natural experiment” presented by online recovery communities. For example, intherooms.com provides its members with the opportunity to participate in the same task (i.e., an online meeting) through a number of different technologies including chat rooms, forums, and video meetings. As members experiment with multiple types of interaction around the same purpose, they are able to describe and articulate the factors that influence their choice of medium. Dr. Yarosh’s work on the ABCCT questionnaire provides a validated measure of user perceptions of the tradeoffs between different communication media [64]. As part of this investigation, the ABCCT will be administered to interview participants to pilot an early adaptation of the instrument for this context. The eventual goal would be distributing the adapted ABCCT more widely to the online recovery community, allowing the investigators to develop a better model of the role of different communication technologies in creating and maintaining strong ties.

**4. Current Status**

Dr. Yarosh has begun initial formative investigations to understand the social practices around technology in twelve-step groups. Her six-month ethnography and in-depth interviews with members of Alcoholics Anonymous and Narcotics Anonymous have been published at the top venue in her field, receiving the Honorable Mention Award (top 5% of submissions) [63]. While this initial work has focused on understanding the role of technology in the recovery of members who attend face-to-face meetings, the work helps contextualize this proposed investigation, will serve as a basis for comparing online and offline activities, and as a source of additional inspiration for the design workshops.

**5. Specific Research Activities**

This section briefly describes the proposed research methods and their application to the topics above.

**Online Participatory Observation of intherooms.com**

In order to develop better intuitions and to initiate a dialog with the members of intheroom.com, the investigators will conduct ethnographic participatory observation within this community. The investigators will introduce themselves as researchers through their profiles and participate in forums, chat, and open-to-all video meetings. These participatory observations will sensitize the researchers to the needs of this community and serve to inform the other methods of data collection and the design line of inquiry.

**Collection of Crawled and Scraped Data from the intherooms.com Community**

The online community intherooms.com is crawl-able with standard methods. The investigators will use Python scrapy libraries to crawl and scrape relevant data from public spaces of intherooms.com. The following are examples of the type of data that is available that the investigators will be able to collect through this and related methods of web crawling and scraping:

- All public profile information
- Public dyadic links between members (i.e., similar to “ friending” on Facebook)
• Public posts in forums and chat-rooms
• Who joins at the start of a video meeting
• Full list of video meetings by title, subject, and time
• List of users currently actively browsing the website
• Titles of all forum groups and lists of members for open-to-all forum groups
• Topic tags and other meta-data on posted stories, videos, etc.

The investigators will create timed scripts to gather this data over the course of one year to develop an understanding of the evolution of the relationships and activities in this community over time.

In-Depth Interviews with Online Recovery Community Members
Based on the findings of both the participatory observations and the results of the quantitative analysis from the crawl and scrape of intherooms.com, the research team will identify and contact participants for two different in-depth interview studies:

• Interviews with active members of intherooms.com focusing on how they negotiate anonymity and support online, the relative tradeoffs of each of the communication technologies they use online, and personal narratives about forming and maintaining strong tie support networks on the Internet.
• Interviews with active leaders and trusted servants within different online recovery groups, focusing on their experiences in managing and enacting anonymity at the group level while protecting the social norms and practices of the group.

Interviews will be transcribed and coded using the thematic data-driven method recommended by Seidman [50]. Multiple members of the research team will work together to resolve coding disagreements and cluster the codes thematically using affinity diagramming.

ABCCT Questionnaire of Online Recovery Community Members
To better understand how participants perceive the benefits and costs of diverse media available for online meetings and other online interaction, the interview participants will also be asked to respond to an adapted online version of the Affective Benefits and Costs of Communication Technologies questionnaire [64] for each of the technologies they frequently use to connect with support online. Though in the future this questionnaire may be deployed more widely to people in recovery, deploying it during the interview will provide the opportunity to gauge and discuss participant responses to understand what kinds of adaptations to the existing instrument may be necessary.

Design Workshops with Recovering Persons in the Twin Cities Area
A synthesis of the results across all of these empirical investigations (the proposed empirical line of inquiry and [63]) will yield both insights and questions about the negotiations between anonymity and support online. The design line of this investigation uses a participatory cooperative inquiry approach to validate these new insights and take steps towards creating usable guidelines, implications, and prototypes. Since these workshops will be conducted face-to-face due to their intensely collaborative nature, the investigators will recruit participants in recovery from the Twin Cities area (see Ms. Diederich’s letter of collaboration), however all those who participated in the earlier interviews will also be formally invited if they have the opportunity to attend (i.e., the project does not include travel costs for remote participants, but should they be local, they are welcome to join). The proposed four design workshops will have the following agendas:

• **Design Workshop 1**: introductions and sharing with the goal of positioning participants as experts in their own right and equalizing power between researchers and participants
• **Design Workshop 2**: researchers share the findings of investigations to date and ask participants to respond, reflect, and critique
• **Design Workshop 3**: participants and designers work together to make sketches and paper prototypes, informed by the findings of the empirical investigations
- **Low- and Medium-Fidelity Prototype Creation**: investigators will take four weeks to develop low and medium-fidelity prototypes inspired by Design Workshop 3
- **Design Workshop 4**: designers share developed prototypes and solicit participant feedback

The contribution of the workshops will be twofold. First, the workshops will allow people in recovery to reflect on and discuss the findings, vetting, validating, or calling into question the conclusions. In the PI’s experience, asking participants to reflect on potential designs is an excellent way of eliciting rich narrative from individuals, especially when the participant is encouraged to assume equal power in that relationship [63]. Additionally, this effort to discuss and reflect on the findings together serves as an opportunity to move away from a “colonial” approach to research and design by laying the groundwork for productive dialog [19]. The second contributions of the design workshops will be in generating design implications and a variety of prototypes that have been validated by participants in recovery. The specific nature of the low- and medium-fidelity prototypes will be driven by the empirical findings and iteratively informed by workshop feedback.

### 6. Work Plan

There are three main thrusts of research activity involved in this project: web crawling, interviews, and design workshops. The first semester is focused on gaining IRB approval for various portions of this work and developing the crawler and scraper to get the initial quantitative information about site use. The second semester will focus on qualitative interviews and questionnaires of selected intherooms.com participants. The third and fourth semesters will focus on the design workshops and prototyping activities with a group of recovering addicts. Three activities will run throughout the study. First, IRB-vetted students and researchers involved in this project will conduct participatory observations of intherooms.com to develop empathy and intuition for the investigated context. Second, the data crawler will remain in operation and collect periodic data about site use throughout the course of this project (the plan does devote time to revisit this data after collecting a full year of use data). Third, the dissemination of research results will begin from semester two and continue throughout the duration of the study.

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<td>Get IRB approval for design workshops</td>
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<td>Design workshop 1: sharing recovery narratives</td>
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<td>Design workshop 3: sketching and prototyping</td>
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<td>Develop low and med-fidelity prototypes</td>
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7. Expected Outcomes
There are several expected outcomes of this work: (1) empirical knowledge, (2) implications for design, practice, and research, and (3) early prototypes validated by the recovery community.

Empirical Knowledge
Based on this investigation, the researchers will develop a better perspective on individual and group interpretations of anonymity and how those are enacted through everyday sociotechnical practices of one online community. The investigators will also contribute to the collective understanding of how people form and maintain strong tie support networks online. While all empirical knowledge is necessarily embedded in a context, the online recovery community is particularly sensitized to the issues of balancing anonymity and support and will articulate a perspective on these core issues that may be relevant to other Social Computing contexts.

Implications for Design, Practice, and Research
To extend the specific research insights to a broader audience, the PI will work in close collaboration with the recovery community and will leverage her own skills as a qualitative researcher and designer. Implications for design will focus on how the specific practices and perspectives in online recovery communities can inform the design of other Social Computing systems that want to encode similar principles of anonymity, mutual-help support, etc. Implications for practice will focus on specific recommendations for recovery support staff, members of recovery communities, and trusted servants of online recovery groups. Implications for research will highlight open questions and opportunities revealed by these investigations to inspire future work on both the context of recovery and the specific concepts of Social Computing the context foregrounds.

Early Validated Prototypes
The design workshops will result in several low- and medium-fidelity prototypes that embody the findings of this investigation around ideas of anonymity and support. The most promising of these prototypes will be vetted by the recovery community and may form a strong foundation for future computing work in this space.

8. Project Team
Dr. Yarosh is the PI for this project and has formal training in Computer Science, Psychology, and Design. She has significant expertise in designing, prototyping, and evaluating Social Computing technologies (e.g., [28,57,64,65]). However, to ideally situate this project, she will also actively seek out collaboration opportunities with those who are more familiar with the needs of the recovery community. Dr. Amy Krentzman (see letter of collaboration), who has worked extensively in the space of recovery from addiction and alcoholism (e.g., [34]), has agreed to serve as a collaborator and advisory member of this project. Finally, the design line of inquiry will require gaining access to recovering addicts and alcoholics who are willing to participate in design and provide ongoing feedback. Ms. Diederich (see letter of collaboration), who manages multiple mission-driven recovery homes for women in St. Paul, will facilitate access to this population. The project team will also include one graduate GRA and one undergraduate researcher (who will be working for credit and to satisfy an honors thesis requirement).

9. Broader Impact
Access to Support for Recovering Addicts and Alcoholics
The Substance Abuse and Mental Health Services Administration reports that as of 2012 there continues to be a large “treatment gap.” Out of the estimated 23.1 million of Americans needing alcoholism or addiction treatment, only about 2.5 million people received it [56]. Those who made the effort to get treatment but did not receive it cited some of the following reasons: could not afford cost of treatment (48.2%), not ready to stop using (26.3%), worried about negative opinions at work or in the community (16.5%), and could not get to treatment (e.g., transportation) (8.2%). These statistics underscore the im-
importance of investigating options that are free, anonymous, and accessible (i.e., AA, NA, free web-based peer support). For many help seekers these are the only viable options, not just an alternative to clinical treatment. A review of web-based interventions for substance use disorders shows the early promise of web-based interventions but also calls out for the need to “identify the most effective elements of interventions” and “to identify who may most benefit from participation in an online intervention” [15]. The proposed approach here is different from that taken by most online interventions. Instead of building an intervention and recruiting users, Dr. Yarosh proposes working closely with existing communities to create new technologies that reflect the values, practices, and traditions of these groups. Design investigations of online communities, personal health informatics systems, and persuasive technologies in this space have the potential to extend availability and transform the way people recover from addiction and alcoholism.

Community Outreach
Dr. Yarosh will work closely with the Minnesota recovery community to carry out this investigation. When appropriate, she will collaborate with the Twin Cities Area of NA Information Technology subcommittee (for example, aiding them in their effort of hosting online meeting and improving the MN NA smartphone app). For participatory design activities, Dr. Yarosh will be reaching out the St. Paul sober home community (see letter of support from Ms. Diederich). Participatory design activities generally benefit the participants by encouraging reflection and active agency (e.g., [20]). This project provides many opportunities to create new knowledge while also advancing the needs of the local recovery community.

Dissemination of Results
Dr. Yarosh will disseminate the major results to the research community by continuing to publish research papers, present work at top-tier conferences, and give talks on this research at other universities and non-profits. In order to share the work with a broader audience, major results and open questions that may stimulate discussion and inspire further research will be posted on several public blogs (e.g., Follow The Crowd blog, GroupLens blog, etc.) and shared with relevant media contacts when appropriate. In addition to communicating the results to the research community, Dr. Yarosh will reach out to the worldwide recovery community by writing for NA Way (a quarterly Narcotics Anonymous magazine) and Grapevine (a monthly Alcoholics Anonymous magazine). The submissions to these magazines will focus on best practices for online recovery distilled from interviews and ethnographic work with the intherooms.com community. These magazines reach the worldwide recovery community and are actively recruiting articles and opinion pieces on the topic of online meetings (e.g., [69]).

Curriculum Development Activities
This research affords the opportunity for Computer Science students to develop expertise in their chosen fields as well as gain experience working in a compelling context across interdisciplinary lines. Adding contextualization to Computer Science classes has been shown to increase retention and attract underrepresented minorities [26]. Dr. Yarosh has a long record of collaborations with colleagues in a variety of disciplines including psychology, learning sciences, family studies, and design. She has had success recruiting and engaging students from traditionally underrepresented backgrounds in the past, and will continue to make this an important priority when recruiting students to work on this research. This work will additionally result in teaching material for Dr. Yarosh’s classes. She will be developing and teaching a class on “Design Methods for Computer Scientists” during the time of this grant and will use recovery from addiction as a broad context to encourage students to design and build novel technologies.

10. Prior NSF Results
None to date; the PI is a beginning investigator.