ARC Method Blueprint: A Guidebook to the ARC Method

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ABSTRACT
The Asynchronous Remote Community (ARC) method draws from existing HCI methods such as focus groups, interviews, diaries, and scenarios. It applies them to an online platform to take advantage of the unique properties of qualitative research conducted through online forums. Drawing on existing literature [5][8] and our experiencing running an ARC study with individuals living with HIV [7], we provide a guide to the most important considerations to implementing an ARC study. This guide emphasizes (1) when and how to use ARC, (2) special considerations for specific populations, and (3) considerations when choosing activities. We end with a discussion of how to move forward to develop a toolkit to assist with future ARC research.

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INTRODUCTION
The Asynchronous Remote Community (ARC) method of qualitative research has only recently been proposed [5] as an alternative to existing approaches. An ARC study involves a group of participants in an online forum (past studies use Facebook for reasons discussed later) completing periodic activities both individually and as a group. Activity is an intentionally broad term, and in practice comprises anything from surveys, to ice breakers (used to increase familiarity among the participants for the sake of activities occurring later), to online adaptations of exiting HCI research methods such as diaries or personas.

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The main advantage of ARC is that it overcomes barriers that make it difficult to conduct face to face (FtF) studies on certain populations. ARC was initially introduced in [5] to account for the fact that individuals living with rare diseases are geographically distributed. [8] extends this to account for the fact that pregnant women and new mothers generally do not have enough free time to participate in FtF studies. In [7] we extend this further to apply to individuals living with HIV in order to account for difficulties with recruitment [3] and validity of data [1] when approaching a stigmatized group.

ARC also generates more data than most FtF research methods. This can be ideal for confirming conclusions. Researchers can use multiple activities to look at the same issue to account for factors that might confound the results. In addition, ARC provides a unique type of data for researchers in the form of the posts and comments in the Facebook group. This information allows researchers to measure engagement, and to better contextualize the data generated from activities.

This paper extends the work in [5] and [8] using our experience from [7] to highlight the advantages and disadvantages of the ARC method. We also take an in depth look at the process for designing and adapting the ARC activities based on the research questions and target population with a focus on adapting activities over time based on previous results. This paper serves to better equip the research community to both replicate the ARC method, and to draw comparisons between studies conducted using ARC.

RELATED WORK
The first published ARC study focused on patients with rare diseases [5]. The activities used in their study are the basis for all subsequent ARC studies. MacLeod et al., present a series of lessons along with their research, with the goal of aiding others in evaluating and using the ARC method. These lessons range from the advantages of having an existing rapport with participants before the study begins, to balancing ethics and practicality to help ensure that participants are fully aware of the type of study they're signing up for when they provide their consent. Ensuring that consent is informed is particularly challenging for online research such as ARC. This difficulty is exacerbated by the fact that many online platforms can potentially create additional risk factors for populations where privacy is key[2]. These lessons, among others, helped form

the groundwork for our understanding of the properties of ARC.

The second published ARC study included a participant pool of both pregnant women and new mothers [8]. The researchers in this study made multiple modifications to the original ARC activities to suit their population. They also made modifications based on lessons from the original ARC study. When reporting on their findings, Prabhakar et al., introduced more lessons learned based off of their own successes and failures. These lessons mostly comprise advice for balancing effort on the part of participants and usefulness of data when designing activities. They introduce a poll in order to gauge the preferences of participants and inform activity design. They discuss the potential for using multiple ARC activities with different input methods to triangulate conclusions based on a more complete picture of the perspective of the participants. They also provide additional evidence to confirm many lessons learned in [5]. Both studies suggest that participants are more likely to feel engaged when other participants are posting to the group regularly.

We expand on this pool of knowledge in our paper on conducting ARC with individuals living with HIV [7]. We examined the suitability of ARC for populations facing stigma, and found that our population was very receptive. This comes in contrast to difficulties that many FtF studies have encountered when approaching individuals living with HIV from accurate reporting [1] (which can be mitigated somewhat through data triangulation) to difficulties with recruitment [3]. We also implemented a participatory design element, and reported on the advantages and disadvantages of incorporating participatory design into ARC.

The lessons learned from these three papers help to form the pool of knowledge that this paper draws from in its recommendations.

KEY CONSIDERATIONS

We present the most important considerations for the ARC method as a whole, population-specific considerations, and details of activities that have been used in each of the three existing ARC studies.

Overall Characteristics

There are some features that will remain consistent in most iterations of the ARC method, no matter the population. These features are important to keep in mind when deciding whether the ARC method is ideal for a particular research project, as well as during the design process.

Of course one of the advantages of the ARC method is its modularity, as it can be modified to suit most target populations. This means that the ARC method can look very different depending on the circumstances of the research. It is recommended that researchers intending to implement it read up on previous implementations to better understand how the process looks in practice.

ARC Platform

The following are the broad details that will remain consistent through any iteration of the ARC method:

Activity Number	*Activity*	*Unique Responses*
A1	Diary	9
A2	Circles	8
A3	Questions	9
A4	Problems	9
A5	Photo Elicitation	7
A6	Solutions	6
A7	Mad Lib	6
A8	Movie Script	5
A9	Rant Line	4
A10	Personas	4
A11	Survey	9

Table 1. Unique Responses By Activity From ARC Rare Diseases [5]

Once participants have been recruited, they are invited to a private online forum (traditionally a closed Facebook group). The forum should be private in order to protect participants' information and prevent outside interference during the study. Participants are asked to complete a series of activities, generally with wide completion windows to give participants of all different backgrounds the time to complete them. These activities are generally adaptations of traditional research methods (e.g. focus groups, surveys, co-design, etc.) While it is recommended that researchers include baseline and debriefing surveys, the overall content of these activities should be tailored to the population and research questions.

Sample Size

We can look to existing literature on focus groups, which share many similarities with ARC, to guide us in coming up with recommendations for sample size. While there is some disagreement, experts tend to put the range at somewhere between five and twelve in order to maximize the generation of useful data [4]. and much of the same reasoning applies to ARC. Too many participants can ultimately dilute interactivity as a few individuals dominate a conversation, and if too few people are participating the value of the interaction goes down. The major difference between the two is that ARC can both support and requires a slightly larger sample. An online forum is easier to moderate than face to face interactions, as it is not necessary for researchers to intervene immediately, allowing for more time to consider an appropriate response to undesired behavior. The extended duration and dropoff means that ARC cannot support a small sample, however. Table 1 shows the number of unique responses on each activity in [5], demonstrating the decline in interest over time.

While the exact numbers will vary based on the demographics involved and the nature of the study, we recommend an ARC study consist of no fewer than ten participants. While it is far more feasible to conduct ARC with a large number of participants than a focus group, each additional participant adds more work for the researcher both during the study and in processing the data. We suggest twenty as a soft cap for the number of participants in a single group. Prabhakar et al., have shown the effectiveness of splitting their sample into homogeneous groups, using the same activities in tandem on these new subgroups [8].

Volume of Data

The ARC method collects a lot more data in comparison to other methods of qualitative research. While this is an attractive feature of the ARC method, it also presents complications. The data gathered from ARC is in a variety of formats, and thus provides many angles from which to look at the trends in the study. This means that analysis will require more effort on the part of the researcher than other methods, especially if the activities implement a variety of medium for their responses. [5] notes this and suggest paying attention to the inputs for each activity to avoid unnecessary challenges in analysis. In our research, we have noted that even organizing text based responses can require quite a bit of effort because the posts made in the group that are not activity related (e.g. initiated by participants) are important to analyze as well. We recommend that if a research question can be answered satisfactorily using other methods of qualitative research, to consider those alternatives before resorting to ARC.

However discussions directed by participants can also be useful. So if research questions are broad enough that rich and varied qualitative data is ideal or necessary, the ARC method is an excellent choice. If the research questions are not broad, ARC is still likely to answer them, but there will also likely be faster and less effort intensive ways of answering those questions. In other words, the less known about what the ultimate findings will be, the more appropriate ARC becomes.

Modularity

The ARC method generally takes more than a month to run, meaning that there is sufficient time to learn more about the population and modify the study as the research is ongoing. While researchers should have a detailed plan before starting the study, they should be prepared with backup activities if they learn that there are certain types of activities that their group is not receptive to or be prepared to introduce completely new activities if the results of a prior one need further clarification. In our initial draft of the activities for [7] we had an ice breaker activity, but we removed it after learning that many individuals in our sample were very motivated to participate in professional research. Since such an activity would not generate much usable data and would come off as informal, we felt that it might annoy these more serious participants. Similarly, activities that have not yet been conducted are not set in stone. The researchers should expect to, at the very least, make small modifications to their plans throughout the study. [8] discusses modifications they made to activities such as modifying an advice columnist activity based on data from earlier in the study. Minor changes based on new information are no less important. [7] added questions to the debrief survey relating to the apps participants used to manage their conditions based on a response to the circles activity.

Population Considerations

All aspects of the design process for an ARC study should be informed by the unique features of the given population. Different demographics will be more responsive to different types of activities, the size of the sample will influence the dropout observed, and the unique situations of the individuals involved may raise additional concerns to which researchers will need to pay attention.

Location

Where the bulk of a group of participants is located helps to determine many aspects of study design. It is recommended that, if researchers are not already aware of where the participants reside, for that information to be included in the entry survey. Geographical location can provide an element of familiarity, and can help to determine how larger samples should be split. It is important to take into account the time zones of participants when deciding when activities should start and end, and location may also influence to what technology participants have access.

Time Constraints

The time constraints of the specific sample should also be taken into account. Sometimes there will be constraints that are specific to the entirety of a population, as in [8] where the participants in the new mothers group were expected to only have small chunks of time where they were available on any given day. There will also be individual time constraints based on the lives of the participants. It is important to try to get a feel for this when determining activity length, so it may be a good idea to ask participants about their availability in the entry survey.

Stigma

It is important to be aware when a population is effected by stigma, as many are. Stigma can effect how easy it is to get willing participants, as well as inform the sort of activities to which participants might be responsive. It is also important to watch for situations where participants could face issues in real life if their participation in the study were discovered. This is an additional personal risk to participants of which they should be informed.

With highly stigmatized groups, such as individuals living with HIV, these concerns should be on the forefront of researcher's minds. In the case of our study, recruiting participants proved to be a major challenge because of this stigma. Recruiting from stigmatized groups has frequently been a roadblock to past research. The solution to this problem, both in our experience and in existing literature [3], has been to come to the population as an insider in some way. This approach is likely to be useful when approaching other populations that are slow to trust due to stigma.

Privacy

The biggest risk to participants in an online study is the possibility of their information being leaked. Even if researchers are completely ethical, the websites used can record information about the participants without the knowledge of anyone involved [2]. This makes informed consent especially important. Participants must also be made aware that, while the researchers are able to moderate activity within the group, they have no control over what participants choose to share outside of it. [5] chose to recruit only from individuals already in Facebook groups related to their condition, so as to not expose any of their participants to privacy risks significantly different from ones to which they were already exposed. For

populations where leaked data could create huge personal risk, researchers could consider hosting their own forum to aid in controlling the possible sources of a privacy leak.

Facebook History
Past ARC studies have been conducted through Facebook due to the ease of use for participants, and the existing structure for setting up private groups. This provides an opportunity for researchers to learn about the online habits of their participants. Looking at the trends of potential participants' online activity before beginning the study is useful for gauging how often the participants are likely to be online [5], and therefore the amount of time that should be given to complete an activity. This can also be helpful for predicting the rate at which activity will drop throughout the study.

Relationship with Participants
[5] suggests familiarity with the participants going into the study will have a positive effect on participation. Researchers will have the opportunity to get participants invested in their work and results, as well as build trust and familiarity.

Activity Selection
The most important part of preparing for ARC is choosing activities for the study. These activities will determine the type of data gathered, and whether they engage the participants or not will be a major factor in whether the study will succeed or fail.

Purpose of Activity
Most activities should be designed with how specifically they serve to answer the research questions in mind. Researchers should consider above all what they intend to gather from a given activity, and how useful that will be as compared to other options.

Effort to Complete
The more effort an activity requires on the part of participants, the less likely they will be able to complete it. In general, if there is a way to get the same or similar results with less effort, then consider that option instead.

Effort to Analyze
Researchers are also capable of controlling the volume of data through activity selection. [5] encourages researchers to be careful about the number of different input methods that are included between activities in an ARC study. The more input methods there are, the more effort the data will be to analyze.

Balancing Usefulness and Effort
[8] discusses the importance of balance between usefulness and effort. Researchers should look at the purpose of a given activity along with the effort that participants will need to put into completing it, and the effort on the part of the researcher to analyze the data. These pieces together will help to inform whether the benefits of an activity are worth the challenges of including it. We recommend that researchers come up with a list of activities that might be useful so as to compare the advantages and disadvantages of each.

Reducing Participant Confusion
Researchers should be aware that participants are likely to find themselves confused by some activities. In [5], for example, participants expressed confusion about the activities that required them to be creative. MacLeod et al., note that examples worked better than explanation, but still caution that creative activities are likely to receive reduced participation, in part due to this confusion.

Technological Requirements
Consider what technology participants need to have access to to be able to complete a given activity (e.g., a camera, a smartphone, etc.) The more specific requirements, the more likely that certain participants will be unable to complete the activity. In [8] the participation in one of their groups dropped from 95% to 50% for the circles activity before rising again, likely in part as a result of the specific requirements for completing the activity. [8] suggests tailoring activities based on what participants are able to complete. Building on this lesson, [7] modifies activities such as circles to have multiple options for completion in order to cater to the needs of different participants.

Sequential Activities
[5] advises against including groups of activities where participants must complete one week's activity in order to participate in an activity further down the line.

Activity Triangulation
[8] suggests activity triangulation as an alternative to sequential activities. The rationale for including sequential activities is that they can provide more detailed answers to a specific question, allowing researchers to confirm or further narrow down the possible interpretations of their results. Prabhakar et al., point out that including multiple activities that frame similar problems differently, and require different input methods, allows researchers to generate this nuance of data without forcing individual participants to complete activities sequentially.

Activity Order
Researchers should pay careful attention to where an activity will be placed in the study. Activities situated earlier in the study are likely to be completed by more people (see Table 1), so if an activity does not require high participation researchers should consider placing it closer to the end so that activities where it is imperative are more likely to get the responses that they need.

Previous ARC Activities
Table 2 contains a list of previously implemented ARC activities along with their advantages and disadvantages. See [6][8][7] for more information on the implementation of each of these activities. S1 refers to whether an activity appeared in [5], S2 for [8], and S3 for [7]. The R/G column refers to whether the response was recall or generative. [5] defines recall activities as activities where the participants must report existing information, and generative activities as any that require participants come up with ideas or be creative. Note that in [8] the researchers instead define activities as reflective, reporting, or creative. Creative maps to generative, and

Activity	Description	S1	S2	S3	G/R	Pros	Cons
Introductions	Participants post to the group introducing themselves.	*	*	*	R	Group cohesiveness	Minimal Data Generation
Diary	Participants write down details about a specific type of event as it occurs.	*			R	Not dependant on memory	High effort (Participants)
Circles	Participants place objects in concentric circles to denote relevance to their lives.	*	*	*	G	Unique angle	High effort (analysis)
Questions	Participants come up with a list of questions that they wish people would ask them.	*			R	Unique angle	High effort (researchers)
Problems	Participants rank problems based on how much they effect their lives.	*		*	R	Gets straight to the issue	
Photo Elicitation	Participants present photos that represent certain life themes and the rationale behind them.	*		*	R	Unique angle	High effort (participants and analysis)
Open Ended Questions	Participants post replies to a prompt given by the researchers.	*	*		G/R	Participant enjoyment	
Solutions	Open ended questions example: participants discuss solutions to problems synthesized from literature and previous activities.	*			G	Highly constructive	
Mad Lib	Participants create mad libs based on humorous aspects of their situations.	*			G	Creative	Confusing
Movie Script	Participants write scenes for a movie about their lives.	*			G	Develops clear picture of participants	High effort, confusing
Rant Line	Researchers set up a number for participants to call and text when they need to rant.	*			R	Coping mechanism	High effort (researchers), low usefulness
Personas	Researchers synthesize personas in the population, participants critique them.	*		*	G	Confirms/corrects assumptions	High effort setup
Poll	Participants are polled about their preferences with regards to ARC activity designs.		*		R	Helps improve ARC	
Surveys	Participants respond to a series of questions given by the researchers.		*		R	Low effort	Not interactive
Validated Instruments	Surveys on which there is existing literature.		*		R	Can compare with other studies	
Advice Columnist	Participants act as an advice columnist giving advice to a fictional character.		*		G	Cathartic	High effort researchers
Ask Me Anything	Participants post questions and receive feedback from other participants.		*		G	Highly interactive	Low Participation
Search History	Participants provide their recent search history to the researchers.		*		R		High effort participants, invasive
Participatory Design	Participants discuss design solutions that could solve their problems.			*	G	(incomplete)	(incomplete)
App Testing	Participants test and give feedback on an app prototype.			*	G	(incomplete)	(incomplete)

reflective and reporting add more nuance to recall. Reflective is essentially 'conceptual recall', where participants are asked to share ideas or feelings. Reporting is 'factual recall', where participants are asked to share concrete information. We use generative and recall here for simplicity.

CONCLUSIONS AND FUTURE WORK

The ARC method is still new to the field of HCI, and the community is actively iterating on the method to improve our understanding of and ability to use it. Most importantly, researchers should attempt to use the method for themselves so that we can piece together trends to come up with consistent metrics of evaluation between iterations of the method. Researchers should also make modifications to ARC and report on how those modifications improved or hindered their studies.

There is also a need to design design infrastructure to support the ARC method. Cross-platform applications that allow participants to more easily complete activities that are commonly implemented in ARC studies could increase participation in ARC studies. Customized forums could avoid some of the privacy issues associated with Facebook, and include interactive features that help to engage participants or are suited to ARC in other ways.

This guide should be a piece of a growing toolkit for the ARC method. We encourage researchers to consider how they can apply ARC to their interests, and share any modifications and tools that they generate with the community for further evaluation.

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