

On Older Adults in Free/Open Source Software: Reflections of Contributors and Community Leaders

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Abstract—Researchers have investigated the lack of diversity in Free/Open Source Software (FOSS) communities, but there have been few studies on age diversity. We interviewed 11 older FOSS contributors and 6 FOSS community leaders (of any age). This formative study reports on 4 key findings from those interviews: 1) motivations of older contributors, 2) benefits and challenges to contribution, 3) older adults' views on discrimination in FOSS, and 4) ways in which older adults enrich FOSS communities. We found that older adults' contributions are driven by intrinsic motivation, altruism, and community identification. In older adults' most recent contributions, we found that there were more social than technical challenges to participation. Interestingly, the majority of older adults claimed to have witnessed discrimination towards others in FOSS, especially against non-native English speakers and women. This stands in contrast to what the general male FOSS developer population reports. Participants identified 10 ways that older adults add value to FOSS communities. We conclude with guidelines for onboarding older adults.

Keywords—diversity; age diversity; free/open source software; FOSS; motivations; discrimination

I. INTRODUCTION

The US Census Bureau projects that by 2030, 20% of the US population will be 65 or older [1]. At the same time we face an increasing demand for people with software development skills. The US Bureau of Labor Statistics projects that there will be a 22% growth in software development jobs from 2012 to 2022, which is a much higher growth rate than other occupations [2]. We therefore expect that more people will have technical skills going into the future. The first wave of these technically-experienced people is reaching retirement. We suggest that contributing to FOSS could be a fulfilling retirement activity that keeps up cognitive activity, enabling older adults to remain active members of the technical community. Keeping up cognitive activity is important because staying cognitively active into retirement has been shown to have health benefits [3]. In this paper, unless otherwise noted, we define “older” as 50 years and older because that is eligibility threshold for the American Association for Retired Persons (AARP) [4].

Another motivation for this work is that increasing age diversity may have benefits to Free/Open Source Software (FOSS) communities. One benefit is an increase in the size of

the developer base. One may claim that the FOSS developer base should be as diverse as its user base. The lack of gender diversity in FOSS is well-noted [5], however very few people have noted the lack of age diversity. There have been some efforts to introduce *younger* people and novice programmers to FOSS [6], however, no one has focused on older adults.

In a 2013 survey of 1,620 FOSS contributors, Arjona-Reina et al. found that only 7.09% are 50 and older, and only 12.03% are 45 and older [7]. Why are there so few older contributors? According to the US Bureau of Labor Statistics, 31.7% of software developers are 45 years and older [8], so FOSS is an outlier. A 2010 survey found that 98% of respondents reported that their technology companies use FOSS [9], so it is difficult to argue that FOSS is an obscure niche. We therefore suspect that something about FOSS communities deters older adults from joining, be it technical, motivational, or cultural. Before we explore ways to involve more older adults in FOSS we must develop a deeper understanding of these barriers. We start by evaluating the current state of the field by interviewing 11 older contributors and 6 FOSS community leaders. Our research questions are as follows:

RQ1. *What roles and motivations do older adults have in FOSS communities and how do these change over time?*

RQ2. *What are the benefits and challenges facing older adults? This will provide insight on how to highlight benefits and reduce challenges in future outreach efforts.*

RQ3. *Do older adults experience or witness discrimination in FOSS communities? There may be something about FOSS communities that deter older adults from contributing.*

RQ4. *Do older adults offer anything to FOSS communities that is different from their younger counterparts? If so, what? To encourage FOSS communities to be more welcoming of older participants, it is important that both groups understand the value that older adults bring.*

The remainder of the paper is as follows. The literature review focuses predominantly on diversity in FOSS, the FOSS joining process, theoretical benefits for older contributors, and virtual volunteering. Then we move on to discuss the study participants' demographics and data analysis methods. Results outlines answers to our research questions. Shortcomings highlights the limitations with this study. The final sections

present possible paths for future work in this area

II. LITERATURE REVIEW

A. Diversity in free/open source software

The impact of FOSS is far-reaching. Recently, 98% of surveyed individuals reported that their companies use FOSS [9]. As use of FOSS becomes more widespread and diverse, it should follow that the developer base should be diverse as well. Though one criterion of the Open Source Definition is that *anyone* should be able to view and edit the code [10], there is a serious lack of diversity in FOSS. Regarding gender diversity, even when recruiting from women-focused FOSS groups, a survey found that only 10.35% of FOSS contributors are women [7]. In contrast a more general survey found that only about 2% of FOSS contributors are women [11].

Nafus, Leach, and Krieger shed light on the lack of gender diversity and propose methods to increase participation by women [5]. The United Nations Educational Scientific and Cultural Organization (UNESCO) gives attention to the gender diversity issue by gathering resources that encourage women to participate in FOSS communities [12]. There is also a FOSS Outreach Program for Women where organizations, such as GNOME and Linux, offer internships for women [13].

Ghosh et al. found a lack of geographic location diversity in FOSS contributors [11]. There has been a plethora of research on comparing geographically distributed teams to co-located teams [14, 15]. However, to our knowledge, no academic research has been done on how to increase geographic diversity purposefully – rather it is seen as a phenomenon that needs investigating.

With regards to diversity of experience, Reagans and Zuckerman show that organizational tenure (how long the person worked at the organization) did not have a negative impact on team productivity [16]. There have been some efforts to encourage “newbies” or those new to programming to contribute to FOSS. The Google Summer of Code is a program that pays students to contribute to FOSS [17]. Morelli et al. use Sahana to increase undergraduate interests in computer science and FOSS [6]. OpenHatch runs workshop to encourage university students to contribute to FOSS [18]. However, there has been no research or outreach done on how to involve those with a high level of software development expertise into FOSS communities.

Other types of diversity including racial, socio-economic status, and age diversity remain to be explored. To the best of our knowledge, Morrison and Murphy-Hill are the only researchers to study older software developers and their roles in online communities. They showed that StackOverflow reputation increases with age, into the participant’s 50’s [19].

B. Free/Open Source Software Joining Process

The Onion Model [20] is the traditional explanation of joining a FOSS community. The idea is that new contributors start on the outskirts as a “lurker”; perhaps they join a project mailing list and watch other interactions, then they slowly become more involved in the project. In more recent research,

Jergensen et al. propose that joining FOSS projects may be more like an “Onion Patch” where contributors transfer skills from one project to another, and may specialize around certain tasks (i.e. not all bug reporters wish to become code contributors) [21]. OpenHatch documented some newcomers’ experiences and potential on-boarding processes [18], but has not performed a rigorous research study.

C. Benefits of Contributing to FOSS for Older Adults

To explore the benefits of contributing to FOSS for older adults, we look to psychology literature. First, contributing to FOSS can be likened to volunteering, which has been found to be beneficial to older adults. In a survey of 253 older adults, Tang et al. show that there is a positive association between volunteers who perceive that their contribution is useful and their mental health [22]. Morrow-Howell et al. [23] cite other studies that show that volunteering is associated with reduced mortality [24] and increased levels of self-rated health [25]. One can hypothesize that the same benefits may be seen with contributing to FOSS, as it is a volunteer activity.

Researchers have also shown that the brain is like a muscle: use it or lose it [3]. They found that performing complex cognitive activities may slow the rate of cognitive decline. Contributing to FOSS is a complex cognitive activity, as it requires domain knowledge, problem solving, and executive functioning. Therefore we may see the same benefits.

D. Virtual Volunteering and Older Adults

Mukherjee interviewed 22 older adults (aged 53-65) to explore benefits and barriers of virtual volunteering for older adults [26]. This study can be seen as a foundation for our work, in that we extend the definition of virtual volunteering to include contributing to FOSS. Mukherjee identified multiple benefits: flexible work hours, flexibility in choice of task/organization, ability to participate for those with mobility issues, and ability to continue using technical skills into retirement. He noted multiple barriers including accessibility issues with the organization’s website, using a mouse, lack of timely communication with the organization, broadband connection issues, and a mismatch in expectations. We compare his results to ours in the Results section.

III. PARTICIPANTS

For this study we interviewed a group of older contributors, and a separate group of project leaders. Table 1 gives an overview of our older participant demographics. We recruited 11 participants aged 50 or over (avg=58.9, std.dev=7.56) through FOSS developer mailing lists and publicly posted flyers. Despite attempts to recruit through women-centered mailing lists, all older participants were male. This may be due to the general lack of diversity in FOSS communities, which means that we’re looking for a double-minority.

We recruited 6 FOSS community leaders (avg=35.9 std.dev=14.33) by emailing them directly, through contacts, or through flyers at a conference. Table 2 gives their demographics. One leader was an older adult, but for the

purposes of this study they counted as a leader. The only data we included from that leader into the older adult data were

IV. DATA ANALYSIS

A. Self-Perceptions of Aging Scale

We used the Attitudes Toward Own Aging subscale [27], analyzed similar to Levy et al.'s study [28]. This subscale poses the following options: "Things keep getting worse as I get older", "I have as much pep as I did last year", "As you get older, you are less useful", "I am as happy now as I was when younger", and "As I get older, things are (better, worse, or the same) as I thought they would be." The first four items are yes/no questions. Negative responses with marked with 0, and positive responses with a 1. For the last item, "better" or "the same" are marked with a 1. The marks are summed and the final score ranges from 0 to 5, with a higher score showing a more positive aging self-perception.

B. Code Creation

Codesets for roles (Table 4), motivations (Table 5), and discrimination/age-related topics (Table 6) were pre-defined and derived from the literature. Codes for benefits, challenges, and responses to RQ4, "Do older adults offer anything to FOSS communities that is different from their younger counterparts?", were not pre-defined.

Table 1. Older participant demographics. Bolded numbers show average and standard deviation respectively.

Age	Years in FOSS	Education
50	18	Bachelor's
60	14	Bachelor's
53	11	Master's
57	7	Bachelor's
55	4	College
59	11	PhD
69	10	Master's
53	28	Bachelor's
74	54	Bachelor's
59	30	Bachelor's
50	8	PhD
58.9 (7.56)	17.7 (14.61)	

responses to the Self-Perceptions of Aging Scale [27].

Table 2. Leader demographics. Bolded numbers show average and standard deviation respectively.

Gender	Age	Years in FOSS	Education
M	27	10	Master's
F	36	9	Bachelor's
F	25	4	Master's
M	32	10	High School
M	64	18	Master's
M	31	13	Master's
	35.8 (14.33)	10.7 (4.63)	

Table 3 shows that we interviewed leaders from a variety of projects, both small and large. Very few of their contributors were 50 years or older, and almost none of their contributors did this as part of a retirement activity.

Table 3. Leaders' project demographics.

# of contributors	Contributors 50+	# of retirees
25-50	1 person	0
7,500	About 5%	0
1,000s	Less than 5%	2
40-50	5 or 6 people	Unknown
35	25%	0
2	1 person	0

Interviews of older participants explored the following topics, with many open-ended questions: 1) participant background (age, educational background, first exposure to FOSS), 2) self-perceptions of aging, 3) motivations of contributions, 4) benefits and challenges of contributing, 5) discrimination, either witnessed or experienced, in FOSS communities, and 6) if older adults offer anything different than their younger counterparts, and an explanation. The leader interviews covered the same topics (save the self-perceptions of aging), but also included questions about their interactions with older adults, and demographics of the projects they lead.

The interviews ranged from 30 to 75 minutes. Interviews were done over phone, Skype, or in person. 16 of the 17 interviews were audio recorded. Notes were taken and, if audio recorded, transcribed by the authors.

Table 4. FOSS Contributor Roles (from Ye and Kishida)

Role	Description
project leader	The project leader is often the person who has initiated the project. They are responsible for the vision and overall direction of the project.
core member	Responsible for guiding and coordinating the developer of an OSS project. They have been involved for a relatively long time and have made significant contributions.
active developer	Regularly contribute new features and fix bugs
peripheral developer	Occasionally contribute new functionality or features in the existing system. Their contribution is irregular, and the period of involvement is short and sporadic.
bug fixer	They either discover bugs themselves or are reported by other members. Bug Fixers have to read and understand a small portion of the source code of the system where the bug occurs.
bug reporter	Discover and report bugs
release manager	Coordinates software releases
reader	Active users of the system - they may read the source to learn more but they don't contribute code
passive user	Uses the system in the same way as most of us use commercially available software

The **role codeset** was developed from Ye and Kishida's work [20]. The **motivation codeset** was created from the FOSS literature [11, 29, 30] and researchers ensured that each motivation could be mapped to the volunteering literature in the psychology field [31], [32]. After reading through the data, we added a code (described in Results). **Discrimination/age-related codes** were derived from the psychology literature [33, 34, 35, 36] and FOSS surveys about demographics [5, 7, 11]. Most codes in Table 6 are self-explanatory, except "overaccommodation communication style" (OCS) [39], which

is when an older adult speaks down to a younger adult. Similarly, it also includes younger adults speaking too slowly or too loudly to older adults. OCS can lead not only to poor communication, but also to upholding negative views of aging. Note that there is no code for “Positive Stereotypes Toward Younger People”, as it only came up once.

C. Code Application

Each codeset was applied to the chunked transcriptions of the interview data. **Role** codes were assigned by one researcher and verified by the other. The coding process for **benefits**, **challenges**, and **RQ4 responses** was similar to Dearmen et al.’s application [37] of “affinity coding” grounded theory [38]. One researcher categorized barriers, challenges, and RQ4 responses into themes. A second researcher verified those themes and with two iterations, full agreement was reached between two researchers.

Motivations and **discrimination/age-related** codes were applied borrowing methods from grounded theory [39], but using pre-defined codes. Two researchers independently coded 3.5 interviews (20.6% of the data collected) for motivations and discrimination/age-related themes and reached very high agreement (Cohen’s kappa coefficient = 0.94). After calculating agreement, one researcher coded the remaining data.

Table 5. Motivation Codes

Hars and Ou [29]	Our Codes	Ghosh et al. [11]
Internal		
Self-Determination	Intrinsic Motivation	None
Altruism	Altruism	Share knowledge and skills
Community Identification	Community Identification	Participate in the OS scene
None	Internal Values	Software should not be a proprietary good
	Learning	None
External		
Future Rewards	None	None
Selling Products	Career-Related Benefits	Improve job opportunities
Human Capital		
Self Marketing		
Peer Recognition	Reputation	Get a reputation in the OS community
Personal Need	Personal Project Need	Get help in realizing an idea for a software project
None	"I'm doing it because someone asked me to."	None

Table 6. Discrimination / Age-Related Codes

Code
Age-related Negative Self Stereotype
Age-related Positive Self Stereotype
Awareness of Age-Related Change
Negative Stereotypes Against Younger People
Age-related Negative Stereotypes (towards others) - older adults
Age-related Positive Stereotypes (towards others) - older adults
Overaccomodation Communication Style
Gender-based Discrimination
Non-Native English Speaker Discrimination
Experience vs. Novices / Insider vs. Outsider Discrimination

A. RQ1: What roles and motivations do older adults have in FOSS communities and how do these change over time?

We categorized older participants into different roles using Ye and Kishida’s list [20]. There were 3 timepoints for role analysis: their first contribution, their most recent contribution, and what they feel their role is in general.

Older participants assumed a variety of roles, from reader to project leader (see Table 7). We found that 8 older participants were *active developers* in their first contribution, and 5 of those 8 remained as *active developers* when asked about their general role in FOSS communities. This shows a relative lack of role migration. Further evidence of this is that there was one participant who had remained a bug reporter for 14 years. There was also one participant who moved from a central role to a more peripheral role. Only 4 older participants moved from a more peripheral role to a more central role. Thus, our findings align better with the idea of an Onion Patch [21] than the Onion model [21].

Table 7. Number of older participants in each role at their first and most recent contributions, and in general.

Role	First	Recent	General
passive user	0	0	0
reader	1	1	0
bug reporter	2	1	1
peripheral developer	0	0	1
active developer	8	4	6
release manager	0	1	0
core member	0	3	1
project leader	0	1	2

We investigated motivations for first contribution, most recent contribution, and in general. This differs from previous work on FOSS contributor motivations, which only ask about motivation in general [20, 29]. One survey asked for reasons for “joining” and “sticking with” FOSS development, but did not ask about specific contributions [11].

We identified a motivation not seen in previous FOSS studies, namely, **“I’m doing it because someone asked me to.”** Three older participants and one leader gave this as a motivating factor. Older participants may have more experience than younger counterparts, so people may ask them to address particular problems that align with their known skill-set. It may also be an added motivation for older adults; an explicit acknowledgement of the usefulness or need for their work.

The top 3 motivations for older participants were intrinsic motivation (10 of 11), community identification (9 of 11), and altruism (9 of 11). The top 4 motivations for leaders were learning (6 of 6), personal project need (5 of 6), career-related benefits (5 of 6), and community identification (5 of 6).

Intrinsic motivation

“I enjoy it. It’s just so much more fun than watching TV or whatever. I just get a great kick out of it.”

“I haven’t gone for two days without writing code, in the past 33 years, and part of it, it’s just like exercise for me. I feel bad if I cannot do it.”

Community identification

“...but you continue because of the people and the social side of it. I like a lot of people in the community I care about. So that’s nice.”

“I’d say, there’s certainly an element of the community itself, being a place I like to be, you know, it’s almost like, you go hang out at a neighborhood bar, or something, some people like to do that.”

Altruism

“I wish I could cure the common cold and solve the world’s energy problems. That’s out of my steer of abilities and interests. So I can do software and it helps other people.”

“Part of it is because I actually like helping people.”

As shown in Figure 1, older participants’ reasons for contributing seem to differ than the general FOSS population surveyed in Hars and Ou [29] and Ghosh et al. [11]. This may mean that outreach for older adults should emphasize on intrinsic factors and social aspects rather than on learning new skills or how contribution can benefit their reputation/career. This comparison comes with caveats. Our sample was very small, and we asked participants many questions about their motivations, whereas surveys have only asked 1 or 2 questions. This means that our participants had more opportunity to list motivations. When comparing “motivation codes” to other studies, we acknowledge that interpretations had to be made. We tried to map the codes that correlated most closely (see Table 5), but we are aware that this is not a perfect mapping.

B. RQ2: What are the benefits and challenges to contribution for older adults?

There were multiple benefits mentioned by older participants (see Table 8). Related to community identification, they found that **community** was a benefit. **Satisfaction, widespread use, improved skills, and ease of use** were other benefits.

Table 8. Benefits of FOSS Contribution.

OA %=Percentage of older adults. LD %=Percentage of leaders.

Benefits of Participation	OA %	LD %
Community	36.36	66.67
Satisfaction	27.27	16.67
Improved skills - coding, knowledge, leadership	18.18	66.67
Widespread use	18.18	0
Ease of use	9.09	0

Additionally, we see a benefit in participants’ self-perceptions of aging. We used this scale because: “Self-perceptions of aging had a greater impact on survival than did gender, socioeconomic status, loneliness, and functional health in this cohort. [28]” With an average of 4.08 out of 5 (where 5 is the highest and best, std.dev=0.67), our participants had highly positive self-perceptions of aging. This brings up more questions than it answers. One may hypothesize that those with positive self-perceptions of aging are more likely to contribute to FOSS communities, or that FOSS helps older adults develop a more positive self-perception of aging. As one of our subjects explained: “It’s great when people finally meet you and they go ‘Oh!’. It changes their perception of aging and that feels – ya, open

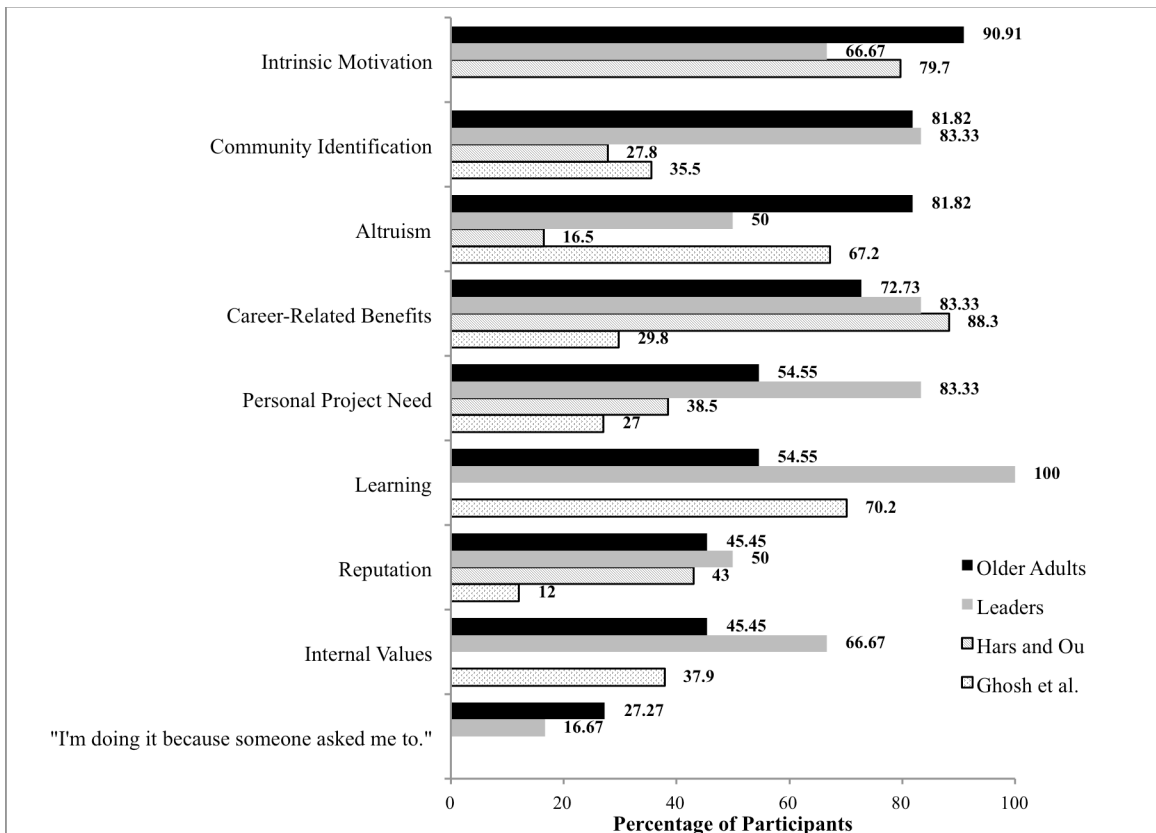


Figure 1. FOSS Contributor Motivations

source opens all of that.” However, there is also the possibility that since we interviewed mainly “young-old” participants, their self-perceptions of aging may be more positive than “old” or “old-old” participants.

Regardless of the reason for the high scores for self-perceptions of aging, the result shows that contributing to FOSS does not harm their self-perception. Therefore we argue that older adults should be encouraged and empowered to participate in FOSS communities.

The **social challenges** mentioned in interviews were: (1) general (e.g. the participant said there were social challenges but did not describe them in detail), (2) company doesn't allow it/makes it difficult, (3) conflict with others, (4) difficulty with communication, and (5) mismatch in expectations. **Technical challenges were:** (1) general, (2) not understanding the code base, (3) introducing bugs, (4) adopting new tools/ languages/ processes, and (5) licenses. Notably, we also asked if participants found anything **particularly easy** about contributing. Responses to that included (1) general, (2) licenses, (3) development process, (4) tools, (5) social aspects, and (6) having experience with the topic. Six of 11 older participants and 5 of 6 leaders note time as a barrier to contribution.

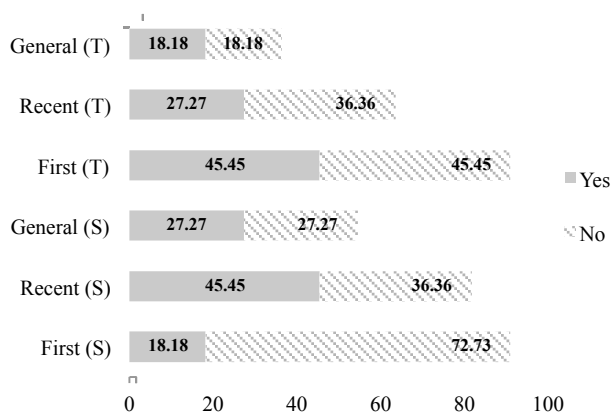


Figure 2. Percent of older participants experiencing challenges. Graph shows Social (S) and Technical (T) challenges for first contribution, most recent contribution, and in general.

As shown in Figure 2, older participants faced more technical challenges on first contribution, and more social challenges in more recent contributions. Note that Yes/No responses will not add up to 100%. If the participant *only* mentioned social challenges, we did not mark that as a “no” for technical challenges because they did not explicitly state that they did not have technical challenges.

If we compare these challenges to the older adult virtual volunteering literature [26], we see similar social challenges, including a lack of responsiveness from host organizations and a mismatch in expectations. Hinds and Mortsensen find that employees reported more conflict in geographically distributed teams [40]. While FOSS teams may not be *geographically* distributed, they are distributed and much communication happens online. In addition to the notion that

there may be more conflict in FOSS teams, older adults may find such conflicts more annoying, as they may have worked in a co-located corporate setting for many years longer than their younger counterparts.

The technical challenges mentioned in Mukherjee’s study [26] were related to broadband connection issues, using a mouse, and website usability. These did not mirror the technical challenges in our findings, as our participants are technically experienced, which was not necessarily the case in the virtual volunteering literature.

These findings suggest that outreach efforts should emphasize the social aspect of contributing because there were social motivations and social challenges. That said, there *are* technical challenges, so those should be addressed as well.

C. RQ3: Do older adults experience or witness discrimination in FOSS communities?

We coded interviews for discrimination against gender, age, native language, and experience. We asked open-ended questions about discrimination, and then a follow-up question about ageism. Notably, 8 of 11 older adults mentioned witnessing discrimination against non-native English speakers in FOSS communities: “I have definitely seen it when there are people from outside of the US that are participating. Recently, particularly, Indian or Middle Eastern names tend to not get taken seriously.”

Seven of 11 older adults mentioned gender discrimination. For instance: “The worst of it I think I have seen is kind of sexism at the sort of objectifying of women, the weirdness around women particularly as a minority in the communities. And sometimes it’s weird and uncomfortable and sometimes it’s worse than that.” In Nafus, Leach, and Krieger’s analysis, they found that of the male FOSS contributors surveyed, only 20% reported observing or experiencing discrimination, whereas about 75% of women reported observing or experiencing it [5]. Because the survey was over 10 years ago, it may be the case that gender discrimination has become more salient in recent years. Even though all of our older participants were male, 63.63% reported observing or experiencing gender discrimination. Older adults may be more aware and mindful of social issues compared to the general FOSS contributor population.

No one mentioned experiencing or witnessing ageism. However, we coded for ageist themes against younger people, and negative age-related stereotypes toward older people. Five of 11 older participants said something that was coded as negative stereotypes against younger people. In a comment about both gender-discrimination and one loaded with negative stereotypes against younger people, one subject commented: “I expect it’s more of the younger, more testosterone-laden ones being chauvinist pigs.”

Four of 11 older participants made statements coded as *age-related negative stereotypes towards others*. This does not mean that participants share that stereotype necessarily; in some cases they were recounting an event where someone in

the community held that view. One subject recounted how someone had an age-related negative stereotype applied to him: “*Anyway, he was very like, to me, ‘grey beard, that’s like grandpa stuff’. He didn’t like talking to me.*” It appears that there is some ageism in FOSS, both toward younger and older people, though no one explicitly labeled it as ageism.

Though online communities assure some level of anonymity, 10 of 11 older participants reported that at least some part of the community knew their gender, background, or age. After asking leaders why they think ageism may not be apparent in FOSS community, one replied that there were not enough older adults in the community to witness ageism. This may be true. However, it may be that since ageism is completely entrenched in Western Society [41], people do not think of it as a form of discrimination when compared to other types of “socially unacceptable” discrimination.

D. RQ4: Do older adults offer anything to FOSS communities that is different from their younger counterparts?

Only 1 of 17 participants thought that older adults contributed nothing unique. The others identified 10 distinct ways older adults benefit FOSS communities. They were:

1. Software development experience
2. Understanding technology trends
3. Life experience as a user, parent, spouse
4. Experience in general
5. Maturity
6. Understanding computer/software architecture
7. They may have more time
8. They may have more connections/networking
9. Wisdom
10. Professional experience in general

Regarding understanding technology trends, one leader stated: “*They have seen technologies wash over. They know what’s out there.*” [...] “*They have insights about open source.*” On an entertaining note, another leader explained how experience with marriage could benefit FOSS: “*Older men – They may be married, so they understand long-term relationships. They have learned how to compromise, have rational discussions and communicate. These skills are of profound importance but young folks think it doesn’t matter.*” These responses show that participants see many benefits for involving older adults, and suggest that these benefits be made clear to the FOSS community at large.

VI. SHORTCOMINGS

As with any empirical work, our study is not without limitations. First, the sample size was small, which is an artifact of the small population we are studying and the exploratory nature of our research. Another limitation is that participants were on the “young-old” spectrum. Our results may have varied greatly if we were to interview only contributors over 65, for example.

Another limitation is that we did not interview technically experienced older adults *who are not* contributors for contrast. Doing interviews of this type may help explore why there are

not more technically experienced older adults contributing. We plan to investigate this population in the future.

VII. GUIDELINES FOR INVOLVING OLDER ADULTS IN FOSS

From the information gleaned from this study, we plan to develop a workshop curriculum to help older adults join a FOSS project for the first time. This will be in the same vein as OpenHatch workshops [18], but instead of being geared toward traditionally aged CS undergraduate students, they will be tailored for older adults. We identify three guidelines that we intend to apply in a future workshop:

Focus on the social aspects. Teach participants how to communicate effectively in a FOSS community. Highlight that contributing is not only about technical skills – it is also about building community, making friends, and communicating. Build cohorts of older contributors. We plan to do this through a private forum that will serve as a safe-haven for older contributors to share their experiences. We plan to inform new contributors of in-person user groups, conferences, etc. that they can attend to get to know others interested in FOSS.

Match contribution efforts to individual motivations. Continue to ask participants *why* they are contributing. Be sure to identify how those motivations can be met through FOSS. Perhaps pick projects that align well with their motivations. If they are deeply interested in altruism, it may make sense to encourage them to contribute to a humanitarian FOSS project.

Don’t ignore the bad stuff. Talk about discrimination and potential barriers to communication. Provide participants with the tools to change the community – give them the language they need to resist/deter discrimination. Introduce them to resources that they may use to overcome barriers.

VIII. CONCLUSION

Given the lack of age diversity in free/open source software (FOSS) communities, we conducted a formative study by interviewing 11 older contributors and 6 community leaders (of any age). We found that older participants have a variety of roles in FOSS communities. Their top 3 motivations for contributing were community identification, altruism, and intrinsic motivation. In their most recent contributions, older participants experienced more social than technical challenges. Many older participants had witnessed discrimination against non-native English speakers and women in FOSS communities. On a positive note, older participants and leaders identified 10 unique ways that older adults add value to FOSS communities. From these findings, we propose three guidelines for onboarding older contributors: 1) focus on social aspects, 2) match contribution efforts to individual motivations, and 3) don’t ignore the bad stuff. Finally, we see an untapped opportunity for enabling older adults to contribute to FOSS, where they are able to remain productive long into retirement.

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