

How are Diverse End-user Human-centric Issues Discussed on GitHub?

Dr Hourieh Khalajzadeh

Dr Mojtaba Shahin

Dr Humphrey O. Obie

Prof John Grundy

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SEIS - Software Engineering in Society

<https://www.monash.edu/it/humanise-lab>



Human-Centric Issues

- Deliver efficient and satisfactory solutions to fulfill the expectations of diverse end users
- Lack of understanding and addressing of human-centric issues
- Human-centric issues: *“the problems that **diverse users** face when using a software system, due to the lack of (proper) consideration of their **specific characteristics, limitations, and abilities**”*
- Such characteristics need appropriate consideration



<https://www.gettyimages.com.au/detail/photo/happy-mature-teacher-assisting-school-kids-in-using-royalty-free-image/1048099316>

GitHub Issue Comments

- Developers' discussions can be a major factor in deciding how a system evolves
- Include information beyond how a system works
- Online software repositories, e.g., GitHub, attract a lot of discussions between developers on a variety of different topics
- Play a significant role in improving the capabilities of software developers/users
- Analysing issue comments might reveal the **consideration of diverse end-users' human-centric** issues from the **viewpoint of developers**.

The screenshot shows a GitHub repository page for 'w3c / wai-people-use-web' (Public). The 'Issues' tab is selected, showing 21 issues. A specific issue titled '[user storeis] Additional techniques to support people with dyslexia #131' is highlighted with a red dashed box. The issue was opened by 'iadawn' 22 days ago and has 1 comment. Below the issue title, a comment by 'iadawn' is shown, also highlighted with a red dashed box. The comment text is: 'Based on feedback in #120 In addition to TTS, another helpful support for individuals with dyslexia is the ability to increase font size, line height, and even change fonts. Suggest adding something in here to emphasize that the site should respect these user preferences. Another preference that should be respected is "Reduced motion"'. Annotations include a red dashed box around the issue title, a green dashed box around the comment text, and a blue dashed box around the phrase 'Human-centric discussion' which is written in blue text. A blue arrow points from this text to the word 'dyslexia' in the comment.

RQ: What end-user human-centric issues do developers typically discuss in their GitHub repositories?



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Project Selection

- Selected 12 projects hosted on GitHub.
- Considered a diverse range of applications
- Focused on end-user-based projects with different sizes, domains, and types of users

Apps with millions of users

- Firefox

COVID-19 contact tracing apps

- COVIDSafe app developed by the Australian government
- Corona-Warn-App developed in Germany

Healthcare apps/tools

- HealthChecks as the most popular healthcare-related GitHub repository

Apps for vulnerable users

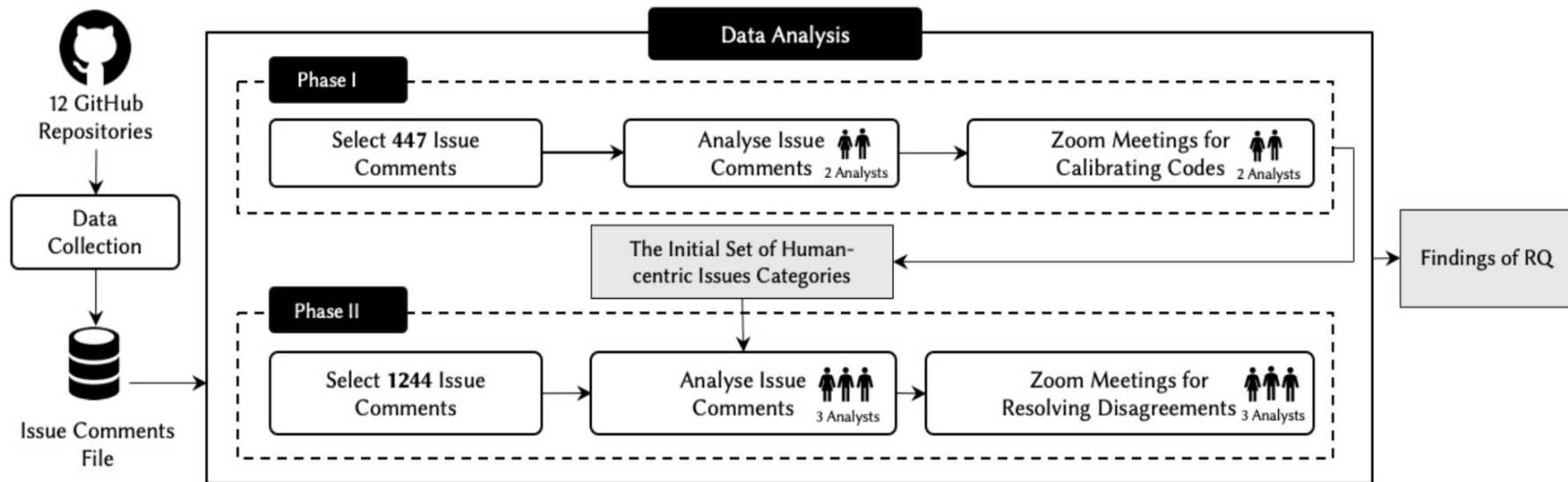
- Six projects designed for dyslexic users

Projects studied



Project Name	Repository Name	URL	# Issue Comments	# Contributors	# Watch	# Star	# Releases
COVIDSafe-ios	AU-COVIDSafe/mobile-ios	https://bit.ly/3sosjuq	34	2	57	279	N/A
COVIDSafe-android	AU-COVIDSafe/mobile-android	https://bit.ly/39zZouF	46	2	60	364	N/A
Firefox	mozilla-mobile/firefox-ios	https://bit.ly/2LszT6O	8228	190	483	9.9k	121
Cwa-app-ios	corona-warn-app/cwa-app-ios	https://bit.ly/3oNJao6	2010	72	88	1.5k	145
Cwa-app-android	corona-warn-app/cwa-app-android	https://bit.ly/3oN5M8v	340	77	120	2.2k	112
HealthChecks	healthchecks/healthchecks	https://bit.ly/3srT1Cs	1227	55	90	3.4k	24
NavCog	hulop/NavCogIOS	https://bit.ly/3nIYyAP	99	5	13	10	5
Corsaire	snigle/corsaire	https://bit.ly/3oKjoBe	19	1	3	5	N/A
OpenDyslexic-chrome	OpenDyslexic/opendyslexic-chrome	https://bit.ly/2LNdDEm	61	8	4	35	19
eBookDys	garconvacher/eBookDys	https://bit.ly/2XJWZIm	3	N/A	3	6	N/A
OpenDyslexic-firefox	OpenDyslexic/firefox-extension	https://bit.ly/3oNw6z8	19	N/A	2	6	N/A
Predict4all	mthebaud/predict4all	https://bit.ly/39w4xEh	2	N/A	2	1	2

Data Analysis



Manually analysed 1,691 issue comments collected from 12 GitHub repositories.

Human-centric issues

Inclusiveness

Privacy & Security

Compatibility

Location & Language

Preference

Satisfaction

Emotional Aspects

Accessibility



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Human-centric Issues Categories

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"Using a German App Store account is just **not possible for many of us**, ... I am surprised we don't hear more in the media about this **large group of people being locked out of participating with the app.**"
- (Cwa-app-ios)

- inclusion or exclusion of specific groups of users
- discrimination toward a specific group
- age and gender, and socio-economic status of the users

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An app **does not get permission from the user to access location**, and then **still tracks the user's location** by BLE-scanning ... but leads to the requirement to ask the user for location permission, even though the location isn't used within the app." - (Cwa-app-ios)

- privacy, security, data protection, reliability, and trust
- accessing the location and private data of a user

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The app is just a front end for an API that was developed by Google. And Google of course wants to sell more phones, so **they only implemented it for newer Android versions, not for the old ones.**" - (Cwa-app-android)

- compatibility of an app with different devices, operating systems, and platforms
- users' socio-economic status, i.e., not having access to the latest phones
- developers' ignorance, i.e., not taking all different platform choices

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"... the idea of CWA is not to be a commercial app but rather a social service the value of which increases the more people use it. If this requires to **support all iOS language** then be it so..." - (Cwa-app-ios)

- physical location of the user
- language or culture-related issues

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"widgets are meant to be highly contextual. The items in a widget can change, **depending on whether it's relevant to users' need or not**. So, instead of disabling the icon, **we should hide it** when there's nothing to erase." - (Firefox)

- user's preferences
- features or functionalities that users prefer based on their specific human characteristics.
- requesting new features, or requests to change an existing feature, and privacy-related issues due to personal reasons

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“With this new approach every time we go between a whitelisted page to a non whitelisted page we’d have to load/unload lists. Imagine if **a user had whitelisted reddit**. every time they tapped on an external link they’d load all the lists into the tab. **every time they went back all the rules would be added back in.**” - (Firefox)

- users’ satisfaction, dissatisfaction, and pleasure
- users’ complaints, battery usage problems, and spam messages

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Anyone using this service knows the **anxiety of not having absolute and at-a-glance insight into their operations.**" - (HealthChecks)

- emotional impacts of the software on the users
- making the users confused, worried, scared and bored when using the app

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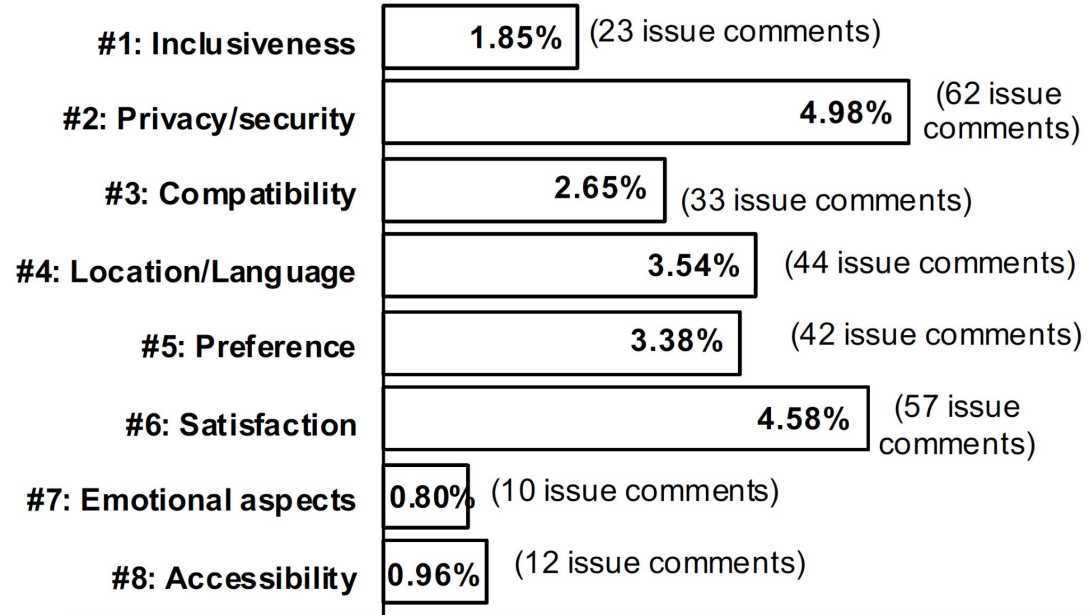
Accessibility

“Changing the color of the accessory view for a disabled row state would be non-standard then! It just seems to us that the indicator is enabled if its colour is more contrast than the background. ... **this is a side-effect of the dark mode** ... I think **it should be left as-is**, and I’ll update those bugs with an explanation.” - (Firefox)

- accessibility issues
- users with physical and mental impairments

Human-centric Issues Occurrence

- A total of **283 issue comments** in the second phase discuss human-centric issues
- **Privacy, Preference** and **Satisfaction** are more often discussed by developers
- Developers seem to discuss less **Emotional aspects** and **Accessibility** related issues



Human-centric Issues in Different Projects

	Inclusiveness		Privacy/Security		Compatibility		Location/Language		Preference		Satisfaction		Emotional Aspects		Accessibility		Total	
Project Name	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Firefox	3	0.82	6	1.63	5	1.36	1	0.27	14	3.81	10	2.72	3	0.82	5	1.36	47	12.80
Cwa-app-ios	14	4.33	11	3.41	13	4.02	18	5.57	5	1.55	17	5.26	3	0.93	4	1.24	85	26.31
Cwa-app-android	3	1.66	21	11.60	10	5.52	19	10.50	6	3.31	11	6.08	1	0.55	1	0.55	72	39.77
Healthchecks	1	0.34	5	1.71	0	0.00	5	1.71	11	3.75	8	2.73	2	0.68	2	0.68	34	11.60
COVIDSafe-ios	2	5.88	4	11.76	4	11.76	1	2.94	6	17.65	5	14.71	0	0.00	0	0.00	22	64.70
COVIDSafe-android	0	0.00	15	32.61	1	2.17	0	0.00	4	8.70	6	13.04	1	2.17	0	0.00	27	58.69

- **COVID 19 apps** (COVIDSafe Australia and Corona-Warn-App Germany) include more human-centric discussions (Privacy, Preference and Satisfaction)
- **General purpose and health apps** have fewer human-centric discussions

Summary

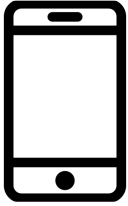
A wide variety of human-centric issues are discussed in different GitHub repositories

Human-centric issues are different across different projects;

There is no structured way of reporting and addressing most human-centric issues on GitHub;

Awareness of human-centric issues can help developers and researchers to incorporate and report human-centric issues more effectively;

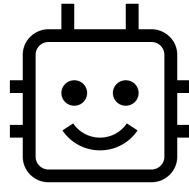
Future Directions



Both developers and end-users

- app reviews reported by end-users on App/Google Play Store
- issue comments discussed by developers on Github

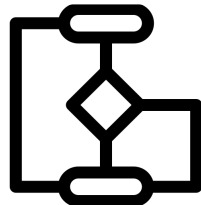
Designing automated approaches to detect human-centric issues



Collecting practitioners' view-point on applicability of such tool

<https://bit.ly/3AZL38I>

Incorporate such human aspects in the early design and modelling phase of software development



Thank You!

Hourieh Khalajzadeh,
Research Fellow,
HumaniSE lab, Faculty of Information Technology,
Monash University



Hourieh.Khalajzadeh@monash.edu
<https://au.linkedin.com/hourieh-khalajzadeh>
<https://www.monash.edu/it/humanise-lab>
[@DrHouriehKh](https://twitter.com/DrHouriehKh)