Accessibility in Software Practice: A Practitioner's Perspective

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Abstract

The significance of accessibility in software practice is emphasized, with the challenges and benefits of accessibility across the software development life cycle.

Conducted a combined qualitative and quantitative approach to collect information via online surveys and interviews with software practitioners.

The results from the collected data include considerable gaps or disparities between the separated groups and the effects of those gaps on quality of the development of accessibility.

Provides remedies for challenges caused by gaps and future perspectives on the significance of accessibility in software design and development.

Goal of the Study

- Software practices should include accessibility in software design and development to meet needs of all end users (including disability users). To achieve that, It's crucial to consider how software practitioner perceive utilizing accessibility practices in real life.

- Identifying the factors that influence software practitioner to prioritize accessibility and providing organizations insights to improve accessibility practices.

Population Targeted

The authors recruited 15 full-time software practitioners with expertise in accessible design and development with experience spanning from 4 to 15 years, on average of 9 yeas, from prestigious organizations including Alibaba, Hengtian, and Microsoft. The participants were chosen by contacting personal connections, and their identities were anonymized to maintain confidentiality.

The author also gathered 365 acceptable responses from online surveys of professionals at different companies across the world and from open-source developers working on GitHub projects, excluding the 15 interviewees.

Literature Background

The accessibility of software development has been the subject of prior studies. The study by Paive et al., which was mentioned by the author, involved a review of the literature on accessibility and how it relates to software engineering procedures.

The author also cites Alshayban et al. study, conducted an empirical study aiming at understanding the accessibility of Android apps
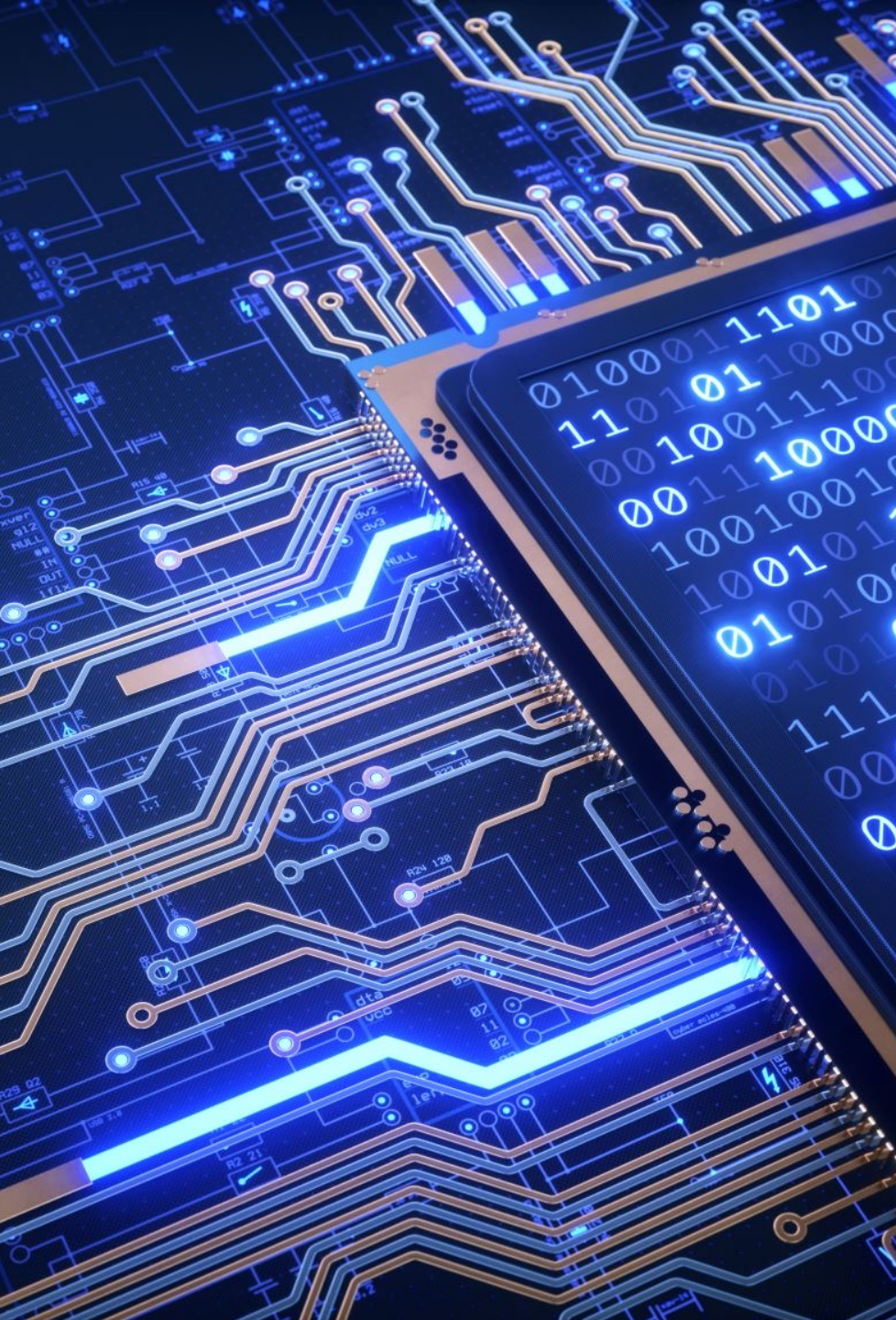
Research Questions

- What are some essential skills required for the software practitioner to associate accessibility with software design and development?

- What are some current software practitioner practices in real industry while dealing with accessibility?

Research Design - Methodology

- The research design of this study was a mixed-methods approach, which consists of semi-structured interviews and online surveys.

- The first stage includes interviews with 15 candidates from top companies in the US and China. Semi-structured interviews are conducted using demographic questions, open-ended questions on accessibility implemented on software, and topics that have not already been mentioned in open discussion. The interviews were transcribed using a third-party service from recordings to transcripts.

Research Design - Methodology

- After transcription, authors used a thematic coding technique and used the MAXQDA3 tool to code the interview transcript. The generated cards were 288 cards, but they were then merged into 122 unique cards. The author used a card sorting approach to categorize and divide the textual data into 8 topics.
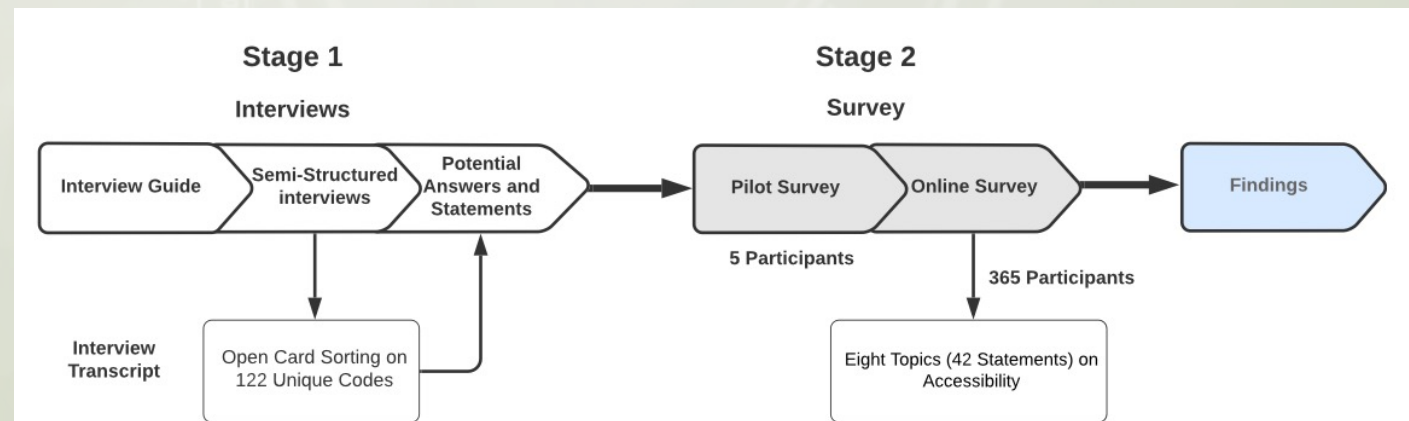

Fig. 1. Sequential mixed-methods approach includes semi-structured interviews and an online survey.

Research Design - Methodology

- The second stage include online surveys with multiple-choice questions and free-text answers . This stage does not include the 15 interview candidates in the previous stage. It is conducted on five members at first, then it is conducted on a larger group of people. They received 365 valid responses. The survey consists of three parts: demographic information, statement scoring, and rationale and suggestions. Finally, the author classified 42 different statement groups into eight topics about accessibility.

Research Design - Methodology

- Survey participants are separated into several demographic groups to compare their perspectives on accessibility in software development in order to gain a better understanding.

- The Likert scale of rating approach is used to analyze the agreement for each statement and used P-values to test for statistically significant differences. The author's study used the absolute effect size, which was calculated to quantify the difference in mean scores between two different groups.

Table 1. Interview and Survey Results on Accessibility Statements

Statement		Likert Distribution		Indirect v.s. Direct				Big v.s. Small				Web v.s. App			
		In total	Overall score	Score	Score	P-value	Effect Size	Score	Score	P-value	Effect Size	Score	Score	P-value	Effect Size
T1. General Considerations of Accessibility															
Accessibility needs to be incorporated into all software projects.	S1		4.12	3.99	4.37	< 0.001	-0.38	4.15	4.13	0.947	0.02	4.14	3.99	0.306	0.15
Accessibility is not only for people who are unable to use standard software.	S2		4.07	4.01	4.19	0.215	-0.18	4.11	3.98	0.144	0.13	4.13	4.00	0.290	0.13
Accessibility should be integrated with all software activities.	S3		4.05	4.08	4.36	0.345	-0.28	4.15	3.82	0.244	0.33	4.06	3.83	0.890	0.23
Accessibility needs evolve during software development and design.	S4		4.02	4.14	4.25	1.000	-0.09	4.01	3.79	0.806	0.22	3.77	4.15	<0.001	-0.38
Goals for accessibility: easy to read, easy to operate, and simple to use.	S5		4.01	4.02	4.14	1.000	-0.08	4.06	3.83	0.066	0.23	4.07	3.89	0.079	-0.18
Accessibility design drives innovation and often solves unanticipated problems.	S6		3.91	3.94	4.11	1.000	-0.17	3.98	3.82	0.265	0.16	4.00	3.62	<0.001	0.38
Accessibility is a widely considered concept in software development.	S7		3.75	3.68	4.01	0.244	-0.33	3.83	3.74	1.000	0.09	3.82	3.62	1.000	0.20
T2. Characteristics of Accessibility															
Accessibility is intertwined with multiple activities.	S8		4.04	3.78	4.21	<0.001	-0.43	4.18	4.00	0.793	0.18	4.11	3.99	0.435	0.12
Accessibility is dynamic in nature.	S9		4.01	4.17	3.83	<0.001	-0.37	4.10	3.91	0.631	0.19	4.09	3.98	0.283	0.11
T3. Work Characteristics															
Accessibility development requires specific knowledge and information.	S10		4.12	4.18	4.14	1.000	0.04	4.21	4.04	1.000	0.17	3.95	4.19	0.922	-0.24
Interaction with outside organizations is needed.	S11		4.07	4.01	4.19	0.148	-0.18	3.88	4.12	0.280	-0.14	4.21	4.00	0.255	0.21
Accessibility task identification is time-consuming.	S12		4.01	4.01	3.88	1.000	- 0.13	4.03	4.08	1.000	- 0.05	3.89	4.28	0.002	-0.39
T4. Organizational Factors															
Accessibility is a marketing strategy.	S13		4.18	4.21	4.28	0.979	-0.07	4.12	4.01	0.897	0.11	4.28	4.22	0.265	0.06
Most commercial and mature projects abide by accessibility design principles.	S14		4.13	4.11	4.23	0.063	-0.12	4.07	4.06	0.894	0.01	4.12	4.08	0.564	0.04
For some big companies, accessibility is not optional but a key task.	S15		4.10	4.07	4.14	0.152	0.07	4.15	4.04	0.151	0.11	4.04	4.09	0.854	-0.05
Accessibility has lack of demand in the industry.	S16		4.05	4.15	3.88	<0.001	0.29	3.92	4.22	<0.001	-0.30	4.21	3.86	0.002	0.35
Accessibility design lacks financial and organizational support.	S17		4.02	4.12	4.02	0.107	0.10	4.09	4.00	0.069	0.09	3.95	4.03	0.068	-0.08
Accessibility is context-dependent.	S18		4.01	4.06	4.14	1.000	-0.09	4.11	3.89	0.806	0.22	3.99	3.81	0.079	0.18
Small companies (teams) do not consider accessibility design.	S19		3.82	3.97	3.82	0.063	0.15	3.81	3.77	0.995	0.04	3.85	3.70	0.166	0.15
There are limited relevant guidelines for accessibility design.	S20		3.70	3.73	3.70	0.947	0.02	3.62	3.78	0.282	-0.16	3.83	3.62	0.108	0.21
Supporting accessibility minimizes legal risks.	S21		3.37	3.48	3.35	0.056	0.13	3.42	3.23	0.320	0.19	3.47	3.29	0.271	0.18
T5. Accessibility Requirement															
Accessibility requirements are an expensive addition for the system.	S22		4.10	4.11	4.00	0.233	0.11	4.15	4.14	0.100	0.251	3.98	4.25	0.057	-0.27
Accessibility requirements are more focused on FR design.	S23		4.07	3.99	4.13	0.121	-0.14	4.05	4.20	1.000	-0.15	4.05	3.96	1.000	0.11
Accessibility requirements are not clearly documented.	S24		4.04	3.99	3.81	0.148	0.18	4.12	4.26	0.280	-0.14	4.09	3.98	0.255	0.11
No resources from companies for accessibility requirements elicitation.	S25		4.04	4.15	4.01	0.186	0.14	3.91	4.24	0.004	-0.33	3.99	3.95	1.000	0.04
Not a core requirement for the project.	S26		4.01	4.13	3.79	0.002	0.34	3.98	4.11	0.013	-0.13	3.99	4.11	0.241	- 0.12
ML and AL can be applied to collect requirements regarding accessibility.	S27		3.78	3.71	3.75	1.000	-0.04	3.88	3.72	0.016	0.16	3.81	3.83	1.000	-0.12
Difficult to understand the technologies behind the requirements.	S28		3.57	3.38	3.52	0.186	-0.14	3.50	3.60	0.394	-0.10	3.76	3.64	0.435	0.12
T6. Accessibility Design															
Provide multiple views to address trade-offs between different types of user groups.	S29		4.02	3.99	4.05	1.000	-0.06	4.01	4.00	1.000	0.01	4.02	4.05	1.000	-0.03
Front-end design is often the major focus to make sure projects are accessible.	S30		3.93	4.01	3.90	0.003	0.11	4.01	3.94	0.077	0.07	3.88	3.84	0.540	0.04
ML and AI technologies could be applied to help accessibility design.	S31		3.89	3.79	3.81	0.235	-0.02	4.03	3.91	1.000	0.12	3.96	3.86	0.280	0.10
Front-end design is often the major responsibility to make sure projects are accessible.	S32		3.77	3.71	3.54	0.299	0.17	3.94	3.83	0.251	0.11	3.80	3.82	0.079	0.08
Detailed design is time-consuming and conducted in an iterative way.	S33		3.71	3.70	3.66	0.138	0.04	3.64	4.00	<0.001	-0.34	3.68	3.61	0.266	0.07
Hard to make accessibility design decisions (like design patterns or tactics).	S34		3.70	3.70	3.60	0.122	-0.10	3.80	3.74	0.388	0.16	3.52	3.85	<0.001	-0.33
Some accessibility standards are out of date.	S35		3.69	3.67	3.79	0.897	-0.12	3.64	3.83	0.674	-0.19	3.70	3.53	1.000	0.17
T7. Accessibility Testing															
A long list for accessibility testing (FRs and NFRs).	S36		4.19	4.21	4.13	0.387	0.08	4.23	4.18	1.000	-0.05	4.12	4.24	0.281	-0.12
It is hard to engage with end-users (get feedback).	S37		4.18	4.29	4.23	1.000	0.06	4.18	4.14	1.000	0.04	4.18	4.08	0.079	0.10
Automatic testing tools are useful.	S38		4.09	4.01	4.14	0.215	-0.13	4.21	4.02	0.871	0.19	4.02	4.17	<0.001	-0.15
T8. Accessibility Evaluation															
No single tool can determine if a site or project meets accessibility guidelines.	S39		4.13	4.11	4.25	1.000	-0.14	4.13	3.98	1.000	0.17	4.19	4.09	1.000	0.10
Human evaluation is always required.	S40		4.10	4.07	4.10	0.266	-0.03	4.21	4.10	0.498	0.11	4.06	4.08	0.719	-0.02
A lot of extra effort is needed for accessibility evaluation.	S41		4.06	4.12	4.06	0.719	0.06	4.10	4.02	0.665	0.08	4.01	4.06	0.651	-0.05
It is difficult to get feedback from end-users for accessibility evaluation.	S42		4.03	4.14	3.94	0.320	0.10	4.02	3.96	0.275	0.06	3.99	4.11	0.182	-0.12
A more comprehensive evaluation for accessibility is necessary.	S43		4.02	4.05	4.00	0.797	0.05	4.14	3.80	<0.001	0.34	4.09	4.05	0.546	0.04
Standards (e.g., WCAG) are helpful for accessibility evaluation.	S44		3.99	3.90	3.84	1.000	0.06	4.13	4.02	1.000	0.11	3.88	4.21	<0.001	-0.33

We used bold to highlight the P-values to indicate statistically significant different between groups. Dark grey cells indicate where former agrees more.

Light grey cells indicate where the latter group agree more. The number in the Likert Distribution column indicates the size of each group. The bars in the Likert distributions from left to right are: Strongly Disagree (1 score), Disagree (2 scores), Neutral (3 scores), Agree (4 scores), Strongly Agree (5 scores), and I Don't Know option.

Table 2. Challenges and Recommendations for Incorporating Accessibility in Practice

Challenges	Non-technical	Technical	Recommendations
Organizational			
Lack of executive sponsorship.	✓		Strong executive support.
Lack of management commitment.	✓		Committed sponsor or leader.
Organizational culture factors.	✓		Cooperative organizational culture.
Organizational size too small.	✓		Face-to-Face communication with customers and collocation of the teams.
People			
Lack of necessary skills and knowledge.	✓		Include team members with high competence and expertise.
Lack of project management competence.	✓		Include team members with motivation.
Lack of team work.	✓		Knowledge in the accessibility development process.
Customer relationship.	✓		Self-organizing teamwork.
Process			
Unclear requirements.	✓	✓	Accessibility-oriented requirement identification.
Unclear project planning.	✓	✓	Accessibility oriented interactive development process.
Unclear project scope.	✓	✓	Commutation with end-users.
Lack of customer role.	✓		Regular working schedule.
Lack of customer presence.	✓		Increase customer presence.
Unclear standard and principle.	✓	✓	Unclear standard and principle.
Inappropriateness of testing suits.		✓	Include appropriateness of testing suits.
Include appropriateness of evaluation process.		✓	Introduce appropriateness of evaluation process.
Practice			
Lack of complete set of accessibility practices.		✓	Rigorous refactoring activities.
Inappropriateness of technology and tools.		✓	Well-designed documentation.
			Delivering most important feature first.
			Correct integration testing.
			Appropriate technical training to team.

Major Findings

- Most software practitioners agreed in their online survey that accessibility is an important aspect to be included in software products.

- Practitioners highlighted the challenges faced by organizations implementing accessibility due to a lack of resources, budget issues, and expertise.
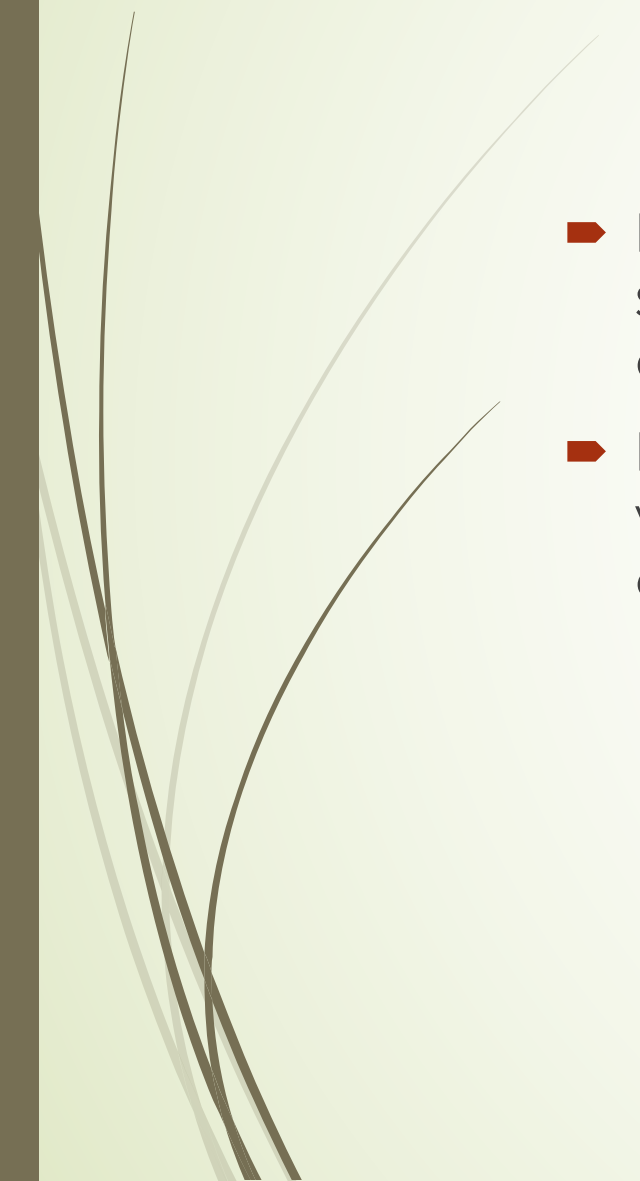
Evaluation of Strengths

- Comprehensive study: An extensive group of 400 diverse software professionals representing direct and indirect accessibility work experience, team size, and other factors were used in the online survey to study.

- Evidence based study: The data-driven approach is used to determine the state of accessibility of a software practice. The author used statistical and effective size calculations to evaluate different groups of people and identify areas where improvements can be made.

Evaluation of Weakness

- Limited Scope: Although it covers a wide variety of analysis of software practitioner's opinions, the opinions of users with disabilities are not included in the study.

- Lack of Budget: Accessibility is considered an additional expense when creating a product. Small businesses have budget issues and cannot afford it.

Discussion points

- How can software companies prioritize and support accessibility in the creation and design of software?

- What are some of the difficulties and advantages of incorporating accessibility into the software, for both users and organizations?

- How can learning skills related to accessibility benefit for practitioners ?

Personal Thoughts

- A software practitioner should take accessibility into view while designing or developing a product, and it should be accessible to all sorts of end users, including those with disabilities.

- As accessibility tools are always growing, it is essential for practitioners to keep themselves aware of major innovations and keep up with industry trends. Hence, may offer users better products.

- The following research can be extended to conduct research on end users' perspectives of accessibility in software practice.

THANK YOU