Accessible Design is Mediated by Job Support Structures and Knowledge Gained Through Design Career Pathways

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Digital designers often do not make their work accessible (e.g., websites failing criteria set by the W3C's Web Content Accessibility Guidelines), and accessible design research discusses many solutions to address this problem (e.g., teaching accessibility within university design and technical courses). However, prior research in this area typically does not acknowledge whether recommendations and resources to support accessible design are suitable for all digital designers due to different training pathways and job support structures (e.g., large-company vs. rural and self-employed designers or designers who learned their skills outside of formal education settings). We interviewed 20 digital designers from rural and urban areas, as well as working from home and remotely, to understand the challenges they experience in making accessible content within the context of their workplace. We find that job support structures mediate the effectiveness of current accessible design recommendations and resources, and we suggest how to improve accessible design support to meet the needs of under-resourced designers.

CCS Concepts: • **Human-centered computing → Accessibility**.

Additional Key Words and Phrases: Accessible Design, Remote Work, Resources, Rural, Workplace

1 INTRODUCTION

Digital designers[1] have had access to information on accessibility for at least 50 years [71][2]. However, we are still living in an age where digital services and technology continue to be inaccessible (e.g., apps [76], social media [22], and websites [99]). Although research has investigated the reasons for inaccessible design (e.g., education, time, money) and recommended how we can support designers (e.g., by improving accessibility guidelines [89] and design tools [24, 93]), prior work does not reflect on how support needs differ depending on resources available to designers.

Our work focuses on understanding the challenges in achieving digital accessibility from the perspective that not all digital designers are equally supported. For many years, CSCW researchers have been interested in the role technology plays in people's work practices and how organizational structures influence people or group collaborative efforts through evolving methodologies [28,

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[1]For simplicity, we will refer to the creators of apps, games, software, websites, etc., as digital designers, regardless of whether they work on the code, user interfaces, and/or user experience since it all contributes to the overall system design.
[2]It is worth noting that the Association for Computing Machinery Special Interest Group on Accessible Computing (ACM SIGACCESS) was founded in 1971 under the name SIGCAPH [41] and earlier discussions by the ACM to support blind people working with computers started in 1964 [87].

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79, 103]. In addition, recent accessibility research has emphasized the need to consider how the accessibility of digital systems is the result of a combination of factors spanning underlying code through to design practice and wider institutional influences [75].

We recognize that digital designers can have a combination of different design training (e.g., traditional university degree vs. self-taught) and job support structures (e.g., large-company vs. rural and self-employed designers). In particular, the perspective of rurality is important [27]. Not only do rural communities tend to fall behind with advances in internet connectivity and technology ownership, but they also face geographic isolation [27]. Thus, we were interested in exploring these different factors, which could limit fulfilling current accessible design recommendations for meeting and working with disabled people [8, 92].

We interviewed 20 digital designers from various work locations and workplace structures and found that: 1) workplace support structures affect designers' implementation of accessibility; 2) unique design career pathways affect awareness and understanding of accessible design; and 3) there are hesitations and challenges in connecting with disabled people.

Our primary contribution is a set of recommendations drawn from our understanding of how access to different levels of resources affects accessible design, as well as the needs and challenges designers anticipate. Our recommendations cover: 1) effort being directed toward supporting designers working in different geographical settings; 2) establishing procedures to guide digital designers who want to connect with disabled people for accessibility evaluations; 3) larger companies continuing to lead the field by exploring more opportunities to support freelance and self-employed digital designers with access to accessibility advocates and training materials; and 4) embedding accessibility support in all types of design tools and alternative educational resources.

2 RELATED WORK

Work practices and organizational structures are a topic of interest for CSCW researchers [28, 79, 103]. Furthermore, accessible design is very much influenced by many factors, including worker knowledge and company structure [75]. Our work focuses on this intersection by investigating the challenges in achieving digital accessibility from the perspective that not all digital designers are equally supported.

2.1 Why Digital Accessibility is Important?

About 1 billion people worldwide have a disability [107], but accessible technology benefits everybody when we consider the need to design for age-related impairments [61], acquired or temporary impairments [19, 105] (e.g., a broken arm [2]), or situational impairments [80, 108] (e.g., interaction issues with a mobile device under varying lighting conditions [94]).

Accessible digital content for all users is only possible if we acknowledge that context plays a big role [73] and that many points in the life-cycle of a product can factor into whether it becomes inaccessible [75]. At its lowest level, these could be issues in the underlying code and/or visual design. As we step back to look at the higher-level causes of inaccessibility, the factors become more extrinsic (e.g., lack of time, poor testing protocols, insufficient education on accessible design, and a mindset within the company that does not value accessibility) [75].

Historically, progress toward a digital society has not been equitable. Technology evolves rapidly, but the focus on accessibility often lags behind within the broader context of advancing human-computer interaction [96], which exacerbates the exclusion of people with disabilities [56]. A further limiting factor is society's misperceptions of assistive technology [84].

2.2 The Reality of Digital Accessibility In Practice

Computing and design fields have advocated for accessibility through numerous design practices such as Ability-Based Design [110], Inclusive Design [13], Universal Design [88], Universal Usability [85], and User-Sensitive Inclusive Design [65]. Although these schools of thought differ in some capacity, they arguably all have the same core value of ensuring the design and development of digital systems that disabled people can use.

Despite continued reflection on—and revision of—the theories that help to guide accessible digital design, we do not see strong results in practice; that is, many digital services, systems, and technologies are still found to be inaccessible (e.g., [33, 34, 53, 113]). Government websites have inaccessible content [3, 6, 30, 40, 69], despite being subject to stricter accessibility laws than regular websites [1], and even Fortune 100 companies with extensive resources can have inaccessible websites [52]. More generally, the largest assessment to date from WebAIM revealed in an audit of one million home pages that 97.4% had at least one WCAG violation and a calculated average of 51.4 errors per page [106]. Finally, mobile apps are equally problematic with inaccessible features [76, 111], especially when developers rarely use the accessibility APIs available to them [100].

This is all to say that an inaccessibility problem in design persists. From an end-user perspective, this has not gone unnoticed; there are real implications and, as a result, increased lawsuits [99].

2.3 Are Digital Designers Adequately Supported in Making Accessible Content?

Digital designers often hold negative attitudes toward accessibility. For many years, we have been aware of perceived tensions between design and accessibility, where digital designers do not believe appealing visual design and accessibility can occur in harmony [72, 93, 95]. However, this perception is misguided since appealing visual design can also have good accessibility [72].

Another reason for inaccessible design is that digital designers are under-supported with the necessary resources (e.g., education, time, money) to make accessible content [15, 49, 68, 89, 92, 93, 95]. For example, a 2021 large-scale survey of Brazilian mobile developers (872 participants) found less than half had some knowledge on implementing accessibility [48]—even familiarity with accessibility guidelines does not guarantee confidence in accessible design [45].

Accessibility education is an essential solution, but, in general, accessibility is often not given enough focus in design and technical courses, meaning professionals lack sufficient knowledge of accessibility [15, 68, 95]. Adding accessibility as a core part of a degree is possible [35, 42, 60] and would help problems with the learn-it-on-your-own culture in computing [14]. However, this requires faculty with knowledge of accessibility, which is often lacking [83].

Accessibility guidelines such as the Web Content Accessibility Guidelines (WCAG) [38] are a practical, low-cost resource that designers can use to support making informed decisions and evaluations of their design's accessibility. However, guidelines are often not widely available or easy to understand [45, 74, 89, 95, 97], promoting the development of alternatives [21, 90].

Digital designers make extensive use of design tools to carry out their work, but the tools need to fit within the design process or risk being abandoned [32, 59, 63]. Although there are tools with a primary focus on creating accessible content (e.g., choosing accessible color schemes for maps [29]), they are often separate tools or not developed in a way that fits well within the overall design process [45, 93]—the tools have limited features that support the full range of a designer's creativity. Automatic accessibility tools could support digital designers quickly [9], but there are limitations on how useful those tools are [5, 66]; user testing remains an integral part of evaluating the accessibility of digital spaces [67, 74, 101]. Two recent papers that build upon extensive prior work have sought to understand accessible design practice further and make recommendations for supporting designers.

The first paper is by Azenkot et al. [4], who looked at understanding how accessibility practitioners promote the creation of accessible products in large companies. Azenkot et al. recruited 30 participants from 13 large companies. They found that although an effort was made to improve accessibility, there is still a need to further improved infrastructure support, development of new guidelines, tools, and accessibility education to ensure all company workers contribute to the creation of accessible products.

The second paper is by Tigwell [92], who investigated how to support digital designers so that they do not rely on using disability simulations in place of collaborating with disabled people during the design process (see [8, 36, 64, 92] for a deeper reflection on issues surrounding disability simulations). Seventeen blind, low vision, and color blind interviewees suggested changing design workplace processes, culture, and staffing, as well as encouraging digital designers to connect with local and national organizations, and recruiting disabled people online for evaluations.

However, when we reflect on who is a designer, it becomes clear that recommendations from prior work will not always provide sufficient support. For example, addressing systemic issues in the workplace is essential, but what does this mean for a self-employed designer? Moreover, designers in different countries do not all have the same access to local and national disability charities, especially if the designer lives in a rural area. Similarly, while the internet provides many opportunities for connecting designers with disabled people, it assumes the designer has access to a stable and fast internet connection.

2.4 The Different Levels of Resources

Geolocation—Urban and Rural Living. There are approximately 3.4 billion people worldwide who live in rural areas [31]. In the US, this is 14% of the population, with a further 25% living in large suburban areas [20]. Inequalities in rural infrastructure have been an ongoing issue. People living and working in urban communities are generally supported with high-speed internet, new technology, and educational attainment [102]. However, this is not the case for people from rural communities who can have less reliable broadband connections and are often left behind in terms of news, technology, and education [27, 102]. Most HCI Research focuses on urban populations instead of rural communities. However, there are opportunities for technology to offer new sources of information to people in rural communities. Their situations and the technology available to them must be taken into consideration [25]. Understanding the options of rural digital designers overcomes our ideas and assumptions of what rurality is in this context [26].

Distinctions Between Freelance, Small and Large Company Designers. Although many people might call themselves a designer, their roles and responsibilities can differ substantially. Some designers are self-employed, some work in small companies, and some in large companies. Each of these roles comes with different levels of time, cost, and leadership support, depending on the country the designers work from [12]. Designers who freelance often work alone and typically will also take on the role of actively finding new clients. It is important to note that among freelance designers, gender role constraints can also affect their pricing of digital designs [18], which has possible implications for the overall design process and accessible design. Designers who work in small companies may or may not work in a team depending on its size, often sharing their workspace with another small company [12]. Small companies such as design startups are under much pressure as they need to be aware of and adapt to the needs of the market in order for it to succeed [37]. Designers who work in large companies often work as a team with members spread out across the globe and have to keep up with the different time zones [12], but often they do not have full creative freedom to fulfill their design ideas due to reduced ownership in a corporate design setting [98].

Therefore, we anticipate finding different experiences for designers working in different locations and for different types of companies. What we hope to contribute with our work are deeper insights

into where there might be commonalities and differences between designers and what this means for current and future accessible design practice recommendations.

2.5 Research Questions

Building on prior work, we focused our research efforts on understanding accessible design in the context of available resources. We ran an IRB-approved study to investigate the following:

- **RQ1**: How does access to different levels of resources influence accessible design?
- **RQ2**: What needs and challenges should be considered to effectively support digital designers working in those different contexts?

3 INTERVIEW METHOD

3.1 Materials and Procedure

We first conducted three pilot semi-structured interviews to refine our process and interview guide. We conducted our interviews on Zoom due to COVID-19. We recorded our interviews to create an accurate transcript that would support our analysis process. Our interviews covered several broad topics on how accessibility is considered by designers, challenges with implementing accessibility and evaluating accessibility, whether designers collaborate with disabled people, and the support they would need to achieve collaboration with disabled people. Our semi-structured interviews were scheduled for 60 minutes (min=37 mins, max=64 mins).

We advertised our interview study from 24th May 2021 to 28th June 2021 among online design communities (e.g., Facebook and Reddit) and sought moderator approval when necessary. Potential participants first completed a screening questionnaire, which provided us with an opportunity to ensure a diverse participant sample. All interview questions were optional. Our participants were compensated $15 for taking part.

3.2 Analysis

We followed Braun and Clarke's steps for thematic analysis [11]. Our analysis of the interview data began with identifying codes, categorizing the codes according to the patterns, and then generating themes. The lead author used the Zoom recordings to write accurate transcripts and re-familiarize herself with the data. She generated initial codes by reading through the data and used Miro (https://miro.com) to support a remote, collaborative, and iterative discussion for organizing and collating codes. The research team collaboratively discussed the codes in several rounds, identifying initial themes, and then produced the final themes. We do not report inter-rater reliability because it is not part of Braun and Clarke's thematic analysis.

3.3 Participants

We interviewed 20 participants (7 female, 12 male, and 1 did not disclose[3]) aged 18 or older who were located across six countries (10 from the United States, 4 from India, 3 from Nigeria, 1 from Canada, Ireland, and the UK). It was important that we asked participants about how they would describe their design career (e.g., working within the division of a company or organization). We also asked participants to self-identify if they primarily worked in an urban area (we provided the examples of a city and town) or a rural area (we provided the example of a village), as well as their current working style (remote, home, office), since available resources would vary on those dimensions.

Table 1 provides an overview of our participants (including three pilot interviews). Our participants varied in the type of design training they had (Table 2), content they designed (Table 3),

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[3]We offered the options: woman, man, non-binary, prefer not to disclose, prefer to self-describe based on prior work [78].

Table 1. Interview participant demographics covering gender, age range, years of experience, and type of career, which includes: Designer working within the division of a company or organization (C), Designing as part of a hobby or pastime activities (H), Self-employed designer (S), Other (O) - Student designer (O[a]) and Occasional design for clients (O[b]). Our participants worked in Urban areas (U - e.g., City, Town) and Rural areas (R - e.g., village), as well as Working From Home (WFH) and Remote (e.g., from a coffee shop) due to COVID-19. Finally, our participants indicated how many of their design projects included accessibility.

ID	Gender	Age	Experience	Career	Working from	Working style	Accessibility
Pilot 1	W	25-34	7	C	U	WFH	40-60%
Pilot 2	M	35-44	20	C	U	Remote,WFH,Office	60-80%
Pilot 3	M	18-24	3	S	U	WFH,Office	20-40%
P1	M	18-24	9	S	U	WFH	<20%
P2	M	25-34	1	C	U,R	WFH,Office	<20%
P3	M	25-34	3	C	U	Office	>80%
P4	M	18-24	2	H	R	Remote,WFH	20-40%
P5	M	18-24	0.5	H	R	Remote,WFH,Office	60-80%
P6	M	18-24	5	H	U	Remote,WFH	<20%
P7	M	25-34	10	H,C	U	Remote,Office	<20%
P8	M	18-24	0.5	O[a]	U	WFH	60-80%
P9	M	18-24	0.5	S	U	Remote,WFH	60-80%
P10	W	18-24	2	S, C	U	Remote,WFH,Office	20-40%
P11	M	18-24	2	H,S	U,R	Remote	40-60%
P12	W	25-34	1.5	H,O[b]	U	Remote	<20%
P13	W	25-34	4	C	R	WFH	>80%
P14	-	18-24	0.5	H,C	-	Remote,WFH	>80%
P15	W	35-44	10	H,S,C	U	WFH	40-60%
P16	W	18-24	6	H,S,C	U	Remote,WFH,School	20-40%
P17	M	25-34	8	H,S,C	U	WFH	100%
P18	W	18-24	3	H,C	U	Remote,WFH, Office	40-60%
P19	W	18-24	4	S	U	WFH	0%
P20	M	18-24	3	H,C	U	Remote,WFH	>80%

Table 2. A summary of the design training interviewees had (multiple choices allowed). Other(s) not indicated: UX/UI Design Bootcamp.

Type of Design Training	Total
Self-taught	11
University (Undergraduate)	9
University (Graduate or Postgraduate)	6
Apprenticeship	2
Associate's degree	2
Other not indicated	1

and experience using different design project tools (Table 4). Although our participants represent various design backgrounds/job descriptions, there were still overlapping needs and experiences. Our participants were all working remotely at the time of the interview—many worked from home.

Overall, our participants included accessibility in their designs when it was a required part of the project scope. They had experience implementing: text-to-speech, using alt-texts, captions, bigger fonts, and good color contrast. Digital designers mentioned finding it difficult to follow

Table 3. A summary of the digital content interviewees created (multiple choices allowed). Other(s) not indicated: Web and social media ads, Embedded Systems, Graphic Designs, Digital Art: Posters, Icons, etc.

Type of Content Designed	Total
Desktop websites	18
Android apps	15
Mobile websites	14
Mobile games	14
iOS apps	10
Desktop games	5
Others not indicated	5
Universal Windows Platform apps	3

Table 4. A summary of the design project tools interviewees used (multiple choices allowed). Other(s) not indicated: Webflow, spark, bubble.io, Canva.

Type of Design Project Tools	Total
Prototyping software	18
Physical tools	18
Graphic editors	17
Visual effects software	11
Coding environments	8
Supported collaboration software	2
Others not indicated	3

guidelines or that they were "*a little wordy*" P7 (Urban, USA), which leads them to use Google or Pinterest to identify accessible designs. Only two participants from large companies mentioned working on projects where the primary users were people with impairments (e.g., Deaf and Hard of Hearing users). P13 (Rural, USA) and P15 (Urban, USA) chose to disclose they have impairments and explained how their experience motivates their advocacy for accessibility.

4 INTERVIEW FINDINGS

Our findings center around three themes: 1) *workplace support structures affect designers' implementation of accessibility*; 2) *unique design career pathways affect awareness and understanding of accessible design*; and 3) *there are hesitations and challenges in connecting with disabled people*.

4.1 Workplace support structures affect designers' implementation of accessibility

Our first theme illustrates the challenges in accessible design that occur between working individually through to working as part of a larger organization, and, in particular, we draw focus to the influence of power dynamics and coping with unexpected situations.

Designers from smaller companies such as startup organizations tend to find that they are at a disadvantage in terms of fulfilling recommended accessible design practices:

> "*I don't have access to people because it's only like a one man job. I just design what the client needs, and I will give it to them, within that time.*" P19 (Urban, India)

The client's influence on design decisions can be strong for designers who do not have a larger support network—as P9 (Urban, Nigeria) emphasizes, accessibility *becomes a requirement* within top-level design jobs, but is difficult to implement when not working for those companies. We found that designers who work independently are experiencing challenges addressing accessibility, but in contrast to larger companies, this can result from a lack of resources (e.g., money). For example, P20 (Urban, USA) mentioned that his status as a university student made it is difficult to connect with disabled people for design evaluations precisely because of fewer resources at his disposal.

Deadlines are a common aspect of design work, and designers find accessibility can be left out due to lack of time. However, even though larger companies may have more designers, it does not translate to freeing up time for accessibility:

> "*A public affairs firm is lot more reactionary. So they want things a lot more faster. So, I feel like I get limited from what I can design. Because I don't have the time to do more creative design work.*" P7 (Urban, USA)

The unfortunate outcome from this work practice is that accessibility gets sidelined—most likely because it was never part of the project scope, which is part of the broader issue. If accessibility is not required, it becomes a 'nice to do' task that is typically not done.

Our participants pointed out that working for larger companies likely improves the available resources to support them in recruiting particular user groups for evaluations. Although accessibility should be negotiated as part of the project timeline (and cost), as our participants discussed, designers often take the clients' lead for what is covered in the design project scope.

4.1.1 Power dynamics in the workplace. When designers are working in companies rather than for themselves, there are often protocols in place and people higher up in the workplace who have the final say on a design (e.g., managers):

> "*It stems from leadership because they don't believe that there's a return on investment for investing, seeing inclusive and accessible products, they see that still as like, you know, 2% of people? Oh, well, if we don't get that 2%, who cares? We'll make our money somewhere else. And it's like, it's not 2% of people.* " P15 (Urban, USA)

This might be one of the few instances where freelance or self-employed designers are at an advantage because they do not have other people on the team overruling any accessible design decisions.

Having someone who is both a decision-maker and an advocate for accessibility can be ideal—this lead-by-example approach would positively affect accessible design. We did find evidence of advocacy, but considering these instances are still not the norm, designers with a smaller network can feel isolated. To provide an example of this, we compare the contrasting views of an urban designer and a rural designer:

> "*My boss at my current job right now, definitely stressed that with the new design to make sure that colors and the text itself are readable.* " P18 (Urban, USA)

> "*But sometimes I do get stuck. I'm the only user experience designer on the team. And so it sometimes I feel like I wish I had another person that I can like talk to, to get ideas, and feed off of one another.*" P13 (Rural, USA)

Prior work has found that sometimes the only way to include accessibility is to have a champion [4]. However, we need ways to ensure that under-resourced designers have access to champions, to become champions themselves, or even to have another designer passionate about accessibility to guide and motivate each other.

4.1.2 Sudden and unexpected situations. Since design work is a fluid practice, we want to draw attention to the concept of sudden and unexpected situations that affect how designers with different levels of resources might cope.

We want to acknowledge the COVID-19 pandemic, which was ongoing during our interviews. At the time of writing, there are evident inequities in how the pandemic is being managed, affecting working conditions. There are vaccines and booster shortages [91], and some countries have not been able to acquire vaccines quickly [54]. Many offices closed in response to the pandemic, and we found most of our participants conducting remote work/working from home. An adjustment of work practice can be disruptive. However, larger companies can provide more support [51], which will improve the transition to working from home compared to under-resourced designers.

Remote work/working from home introduced challenges that affect productivity. P1 (Urban, India) mentioned that "*it is a privilege to be able to access the internet.*" Rural communities typically lag in stable and fast internet, although, even in cities, there can be variability in internet speeds. Eight of our participants had issues with internet connectivity during our interviews, which provides some insights into potential issues if those designers were trying to run a video-based remote design evaluation session. However, this is not to say that rural designers are unable to work effectively:

> "*Oh, to be fair, the internet here is not that bad. And the electricity is stable enough. So, and there's a school close by. And, yeah, they have this sort of, like a workspace. Yeah, so you pay monthly to get, I mean, there's constant electricity and internet.*" P11 (Rural, Nigeria)

Our interview with P11 (Rural, Nigeria) highlighted opportunities for community-based solutions to support rural workers. Alternative use of infrastructure already within the community demonstrates resourcefulness that could be leveraged to further opportunities for under-resourced designers who want to increase their focus on accessible design.

4.2 Unique design career pathways affect awareness and understanding of accessible design

Our second theme illustrates the ways in which design training has become democratized in such a way that it can be obtained through multiple avenues, as well as the implications of such democratization in terms of awareness, enactment, and mentorship for accessible design practice.

We made observations that accessibility awareness, education, and understanding take form in many ways, but since it continues throughout a designer's career, exposure and opportunities were experienced differently. Often when we talk about education on accessibility and disability, we think of higher education. However, digital design is a field where people can access many other resources to train themselves if they wish to switch careers.

Three of our participants described switching careers from engineering and business to design. In the case of P2 (Rural, India), this started with gaining an online certificate and joining a startup about two months later. P12 (Urban, USA) avoided this by initially working closely with designers who were hired and learning the necessary skills herself. Our participants' experience highlighted the opportunities for avoiding going through the long and potentially expensive route of retraining through obtaining a university degree.

4.2.1 Accessibility exposure and training. We were interested in identifying where those opportunities to learn accessible design are found. We previously summarized that some of our participants took alternative pathways into design careers, and it would be natural to ask what aspect of design training might be missed? P1 (Urban, India)—who was a self-taught graphic designer—mentioned that if he enrolled in a college or university course, he would "*expect [accessibility] to be taught*". However, we found that accessibility was not guaranteed in formal design education. Another

influence on accessibility awareness relates to culture since we found that cultural differences may constrain openness for engaging with accessibility:

> "*So, I realized that, like after coming to the United States, we realized that we have a much more open culture about accessibility and how they wanted to make, we want accessibility to be present for everyone, for all users [...] And this is a really good idea. This was something really profound.*" P14 (USA)

In contrast, P7 (Urban, USA) was critical of the level of engagement designers have with accessible design, despite existing laws. He mentioned that designers working for the government and private sector would focus more on accessible design because it is a requirement. Designers who do not work for the government and private sectors have less incentive to follow accessible design practices, but that is not to say that countries like the US always do well in creating accessible designs.

4.2.2 Supporting accessible design practice. Recognizing that designers have different awareness and motivations for accessible design, there is an opportunity to explore various support avenues. P20 (Urban, USA) provided an example where he had heard of a large company providing lectures as a form of continued training. We also found evidence to suggest that working in larger teams meant that designers would learn more about accessibility and support one another through the process. Although it is encouraging to know large companies create learning opportunities due to more resources and serendipitous learning through colleagues, we need to ensure freelance or self-employed digital designers and digital designers in smaller companies are supported with similar opportunities because they do not often have those educational interactions:

> "*Working like a freelance job, you get a lot more freedom. But the thing is, you don't get as much like assistance or mentoring.*" P20 (Urban, USA)

Mentorship is an essential aspect of any professional job. Our participants did discuss an alternative to individual mentorships, such as through meetups to disseminate accessibility awareness and knowledge. P15 (Urban, USA) was able to attend UX events in her town. For designers who cannot make such events, P19 (Urban, India) suggested following podcasts by disabled people who share their viewpoints on using technology. Furthermore, P8 (Urban, USA) felt that awareness and accessible design tips could be shared through online communities such as Behance and within design tool interfaces since designers will be using those tools when they work.

4.3 There are hesitations and challenges in connecting with disabled people

Our third theme illustrates the concerns designers have about the feasibility of accessing disabled people for design evaluations, working with disabled people in a way that accommodates communication needs, and whether technological solutions can offer adequate support.

Prior work has emphasized that many paths can be explored to recruit disabled people for evaluations and for designers to collaborate with disabled people (e.g., reaching out to disability organizations and using online platforms) [92]. We agree that the approach reported in prior work was crucial since disabled people must be part of any discussion related to their involvement in design evaluations. Furthermore, disabled people should get to describe what they view as appropriate solutions for connecting with designers. However, we acknowledge in our current work that those ideas may not be feasible for all types of designers, which led us to share those prior work ideas with our interview participants to identify potential issues that still need resolving. We found there were concerns about connecting to relevant communities for accessible design collaborations.

We found that only four participants recruited disabled people for feedback on their designs. In contrast, our other participants seldom or have never recruited disabled people for feedback on their designs, for example:

> "*I've never had a feedback from someone who [has] a disability.*" P5 (Rural, Nigeria)

> "*I guess right now, we don't have a huge audience for like feedback [...] I know someone who's colorblind. So, sometimes I'll show my project or whatever to them and see if it's clear for them to understand. But unfortunately, I don't have I guess, the means of, kind of trialing my projects on larger bases with, with people with [disabilities].*" P18 (Urban, USA)

When we considered the work support structures of our participants, it was clear that designers starting out or working alone felt they could not consistently recruit disabled people for accessibility tests—we received comments such as prioritizing client needs due to limited resources and working without a team, for example:

> "*Like, for me, as a university student, it's a lot more difficult to get the resources to do that. So for me, once in a while, I do have some friends who are at [college] Deaf and hard of hearing. So I get their feedback, and some of them are color blind as well. And then at [work], we definitely have a lot more resources to do whatever we need to do. So we definitely do reach out to [disabled people]. And it definitely is helpful when you have the resources to do so.*" P20 (Urban, USA)

P20 can reflect on his position as a student creating designs and the limited resources he has compared to when he creates designs for his company.

Furthermore, assumptions are a motivating effort since P1 (Urban, India) believed disabled people are not part of his company's userbase and, therefore, accessibility is not considered necessary. Although, we have to question whether a design firm truly has an audience without disabilities or if their design excludes disabled people from being part of their audience or userbase.

On a more individual level, there were concerns about meeting basic communication needs. We identified instances where our participants recognized "*communication gaps*" such as if the designer did not know sign language (P17; Urban, USA). Furthermore, P1 (Urban, India) had similar concerns about communication with Deaf and hard of hearing people through video conferencing and without interpreters. An interpreter would be necessary since he was not taught sign language at school.

4.3.1 Working with Disabled People. We found that working with disabled people results in a positive experience:

> "*So for that, luckily, we had disabled people in the team itself, or I mean, in our workspace, we were able to. It was easier for them to be able to reach out to them and then get back to us. But I mean, that's how I am aware of, but I don't think that actually going out to people outside that workspace.*" P14 (USA)

We raised this point to our participants as something to work towards. They were receptive to this, acknowledging it would significantly increase consideration of accessibility for a range of impairments. P18 (Urban, USA) and P13 (Rural, USA) recognized the learning opportunities of collaborating with disabled designers. Unfortunately, freelance or individual designers lose out on these experiences. Even smaller companies often have little choice initially on hires:

> "*But for small startups, it's very difficult to implement that. Maybe gradually, they can implement that culture into their organization, they maybe can't do right now. But in the future they can.*" P2 (Rural, India)

Some participants discussed reaching out to people they know who have a disability as a solution:

"*I asked [friend], he is colorblind. So he helped us see if the website was actually helpful? Because I remember playing Among Us! with him, and he couldn't tell the colors. So yeah, I thought he would be the best subject for me to use as an experiment.*" P6 (Urban, Ireland)

However, unless formal procedures are implemented, or the disabled person feels comfortable declining, there is likely a high risk of taking advantage or burdening disabled people when asking them to check accessible design:

"*Yeah, so I have a lot of resources as far as, networks, with people who are Deaf and hard of hearing and people who are blind. Mainly from an email chain that I'm in. So, but I'm not sure, like, their willingness, like, would they be willing to? And, you know, is there something that they would want to be doing? You know, I think there's a comes to a point where people get tired of explaining and get tired of being asked, like, hey, how can we make this better for people?*" P13 (Rural, USA)

P13 (Rural, USA) makes an essential point about possible fatigue, but there are instances where designers would not need to contact disabled people. For example, reaching out to somebody who is color blind to ask about accessible colors is not efficient. Instead, designers could use WCAG as a starting point to ensure some level of accessible design and then reach out for evaluations or more specific discussions not covered by current guidelines. Furthermore, P3 (Urban, Nigeria) acknowledged that "*people with disabilities who are asked to take these types of roles should not just be chosen as tokens or 'window dressing', but should be viewed and treated as equal partners in your organization or initiative.*" Though offering compensation would help to establish recognition of service, the level of compensation possible could differ between large companies and freelance or self-employed designers, which was a concern raised by P9 (Urban, Nigeria).

4.3.2 Working with Disability Organizations. Another discussion point we used was increasing collaborations through local and national disability organizations [92]. Although disabled people from prior work had emphasized that digital designers should be able to reach out to local and national disability organization to run evaluation sessions, we found that reaching out to local and national disability organizations would be challenging for two reasons. First, there was concern that designers or design firms would be viewed as taking advantage—P15 (Urban, USA) discussed the awkwardness around the "*transactional nature*" of businesses doing this to make more money. However, this seems more like an opportunity to educate businesses to offer appropriate compensation and approach disability organizations and their members so that everybody feels comfortable with the circumstances. The second concern was that disability organizations or disabled people would not be available:

"*Maybe, as I said, if I'm there in a city on my, like, my startup company, like where the situation is, situated in [city name]. [If] I'm working there, maybe by the context of my colleagues, or the country, people like the density in the area, or the city, because of that, I may get contact with the disabled people very easily compared to right now.*" P2 (Rural, India)

In this case, P2 (Rural, India) is working in a rural area, limiting the potential access to recruit disabled people. Creative solutions that leverage technology for remote access could be a solution. We found interest in utilizing online services to overcome issues in connecting with disability organizations or disabled people, for example:

"*You could log on to a service or platform and get the disabled users to actively engage in a product. I think that would be nice. That would be a very effective thing.* " P9 (Urban, Nigeria)

Designers are pretty receptive to using online platforms and reaching out to organizations for the most part. However, only five designers were aware of existing online platforms that allow designers to get accessibility feedback from disabled people. P18 (Urban, USA) expanded the organization concept to suggest that colleges/universities create a "beta test" service. Whereas P1 (Urban, India) thought of a separate community on a service like LinkedIn where people can identify themselves as having a disability[4]. Although prior work also emphasized that there are always online avenues to explore [92], we know from our study that internet issues could make such solutions unreliable (see section 4.1.2).

4.3.3 Utilizing accessible design templates and tools. Finally, we want to highlight the benefit that templates and tools have. Designers can often build products with reused components, or the design team might individually create different assets that will be pulled together. As P9 (Urban, Nigeria) said, "*bake in the accessibility*", it would reduce the inaccessibility creeping into the product [75]. Similarly, design tools could do more to warn about inaccessible design:

"*Let's say in an ideal world, how about all of the programs that we use to design. Our Microsoft or Adobe or Google Chrome, if there was a button there that says accessibility mode, and it just figured it out for us? [...] In it, there's a little flag. This is 'inaccessible' we click on it, it tells us why.*" P12 (Urban, USA)

For P12 (Urban, USA), who does not have access to many resources, it would address challenges where they might be unable to find or work with disability organizations. Our participant reflected on design tools guiding accessibility and it was evident that the industry is doing this to some extent. P1 (Urban, India) mentioned color blind simulations in Figma, yet there are many criticisms surrounding disability simulations (e.g., [8, 36, 64]). Other ideas included checklists, benchmarking tools, personal narratives from people with different disabilities, and wikis. However, no single solution is going to be effective on its own:

"*So once even with the guidelines and everything, it says that we use we need to use these colors. The colorblind people might not find my website compatible or not good enough, you know. So after that feedback, you can make changes and it's not gonna take me a lot of time.*" P6 (Urban, Ireland)

From P6, we can learn that guidelines, though helpful at the moment, may not be 100% accurate. Feedback from disabled people can overcome accessibility challenges that most simulations miss.

In summary, designers need to be educated, made aware of, and provided with the right tools and resources to implement accessibility in their design. The current state of resources and how those resources are accessed are far from supporting designers to achieve 100% accessibility.

5 DISCUSSION

We build on prior work by asking how access to different levels of resources affects designing accessible content because digital designers often work in many different contexts. In particular, opportunities are going to differ significantly over the span of different workplace support structures (e.g., large company vs. small company vs. startup vs. freelance or self-employed designers).

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[4]Although P1's idea is in the context of making it easier for designers to identify potential disabled testers and employees, some disabled people may not be comfortable publicly disclosing their disability, and the idea suggests going down an already criticized path where disabled people are to use a separate service [46, 47].

Our study is one of the first to acknowledge and investigate how location and resource inequality factor into the success of attaining accessible design. Our findings showed that there are many nuanced factors related to a digital designers' workplace support structure that makes it challenging to create accessible content. These factors must be considered so that we continue to develop solutions for increasing accessible design that benefits all designers. Furthermore, our findings also made it clear that we need a much broader perspective on how digital designers learn about accessibility because of the many pathways they can take toward building a design career. Accessibility advocates and researchers should address issues in the context of available resources.

5.1 Complex Support Structures and Accessibility Knowledge Exposure

Our 20 participants represented a diverse group of digital designers working remotely, sometimes from home, in rural and/or urban settings for large and small companies, or even as independent designers, and learning design through traditional or non-traditional learning methods.

Two of our participants highlighted how important it is for disabled people to be part of the design process, which reinforces prior work [8, 82, 92]. However, our findings draw attention to challenges dependent on resources with regards to communication requirements with disabled people, as well as online and offline access to disabled people.

Communication is necessary during collaborations, but our findings indicated concerns about resources to support this in alternative modes (e.g., ASL). For example, a designer would need to budget for interpreters as part of the project cost for implementing accessibility. We found that larger companies have more opportunities to absorb those costs. In contrast, freelance or self-employed designers may find it more complex, and the service of smaller design businesses may be viewed as less desirable by potential clients if costs increase.

We found that the level of resources can also affect how digital designers handle unexpected situations, which could ultimately affect accessible design when access to certain services changes. The COVID-19 pandemic was the most prominent current issue affecting how designers worked. However, other natural disasters or emergency events (e.g., office fire) could change the workplace dynamic without warning, which could affect how projects are handled unless the designers are supported to work remotely or from home.

Eight of our participants had issues with internet connectivity during our interviews. Although prior work emphasized that there are always online avenues to explore to connect with disabled people [92], we know from our study that digital designers may have internet issues that make such solutions unreliable (see section 4.1.2). This can be exacerbated in rural locations [102], and there is even a digital divide in the US where fewer disabled people have equal technology access (computers, smartphones, broadband) as non-disabled people [70].

Collaboration activities may be more likely through disability organizations, but not all digital designers are well located for physical access to these organizations. Disabled people from prior work have emphasized that digital designers should be able to reach out to local and national disability organizations to run evaluation sessions [92], yet, our study highlighted challenges where digital designers are concerned about being viewed as taking advantage, and disability organizations or disabled people may not be available in some locations. These challenges need resolving.

5.2 Recommendations

In light of our work, we propose several recommendations for increasing accessible design in a way that can be obtainable for designers working with different levels of resources, workplace cultures, and accessibility knowledge.

5.2.1 Geographical Settings. Inequalities in rural infrastructure have been ongoing issues. It seems that the effects of fewer resources in these settings also impact the extent to which digital designers can fully engage with accessible design.

The Web Content Accessibility Guidelines (WCAG) is an excellent place to start for implementing accessible design (the guidelines also apply broadly to digital design). Although WCAG has its limitations in understandability [89], it is the most comprehensive accessibility resource and one that is low cost (it is free and a primarily text-based website that downloads quickly) for designers in rural or low resource settings who cannot easily access disabled participants for feedback. The W3C's Accessibility Guidelines Working Group continually works on updates, and there is an opportunity to refine WCAG for low-resource settings further. WCAG has a customizable quick reference guide. It could be useful to build on this with pre-made templates for the most frequent accessibility issues, and advice for testing when working with limited resources. This would also help minimize setup issues when digital designers have limited accessibility knowledge.

Similarly, design tools that support accessible design would also provide useful support since one of the things designers have in common is the tools they use. Digital design tools can support accessible design creation and evaluation. Yet, current design tools that support accessible design creation may hide accessibility features in submenus, and the tools may offer criticized methods (e.g., color-blind simulations [92]) or require knowledge of third-party plugins (e.g., Stark). Regarding evaluation tools, prior work has highlighted the potential for utilizing design and development tools to guide accessible design [24, 62, 77, 93, 112], but often tools for automated accessibility testing cannot identify all issues and, therefore, manual testing is still required [34, 101].

On account of the importance of user evaluations, we want to see more research into connecting digital designers with disabled people. There has been work from the CSCW community looking at engaging online participants within the design process [55], yet this was without a focus on accessible design and participants with disabilities. However, there is growing related work focusing on understanding and improving disabled people's remote work and collaboration experiences [10, 16, 17, 81, 104]. For example, Das et al. [17] investigate how neurodivergent professionals carry out remote work from home, with two aspects of the findings underscoring the drawbacks of current remote communication tools and organizational meeting practices. Since online communication is likely the most feasible method for some designers to connect with disabled people, the methods by which they organize and run those sessions to evaluate designs will need to meet each person's access needs. Moreover, additional awareness is needed in managing the potential conflicts that can arise between individual participants' access needs during group activities [17].

Though platforms for designers to collaborate with disabled people and receive their feedback exist (e.g., theweco.com and abilitynet.org.uk), we found the majority of our participants were unaware of them. Regardless, our interviews indicated that for designers in specific rural settings, it would be difficult not only to set up in-person evaluations but also online evaluations on account of unstable internet [58]. Prior work has demonstrated the potential benefits of crowdsourcing accessibility evaluations of a website to address insufficient numbers of qualified professionals to conduct accessibility audits [86]. This might be something under-resourced designers could explore, depending on the cost of such services.

Governments and disability organizations should look into how they can support designers from rural communities with opportunities to connect with disabled people. We believe this is especially important because the COVID-19 pandemic has changed how businesses run. Nineteen of our participants were working from home, and, for the most part, design work can occur remotely. Designers may want to continue working from remote locations, but it will limit their ability to conduct accessibility evaluations unless the challenges reported in our paper are addressed.

Finally, P14 acknowledges cultural differences toward accessible design. Reflecting on this, we should consider how our expectations of accessible design apply to international designers. It seems that designers who train in different countries will be exposed to different viewpoints on accessibility. HCI work is often limited to the global north [7, 50]. In the same way, we are emphasizing that previous accessible design work has not fully engaged with how access to resources influences accessibility. We should also consider the socio-cultural role when we recommend how to address the issue of inaccessible design and what we can do to make this transition efficient.

5.2.2 Maintaining a reciprocal relationship. At a minimum, getting feedback from disabled people is a crucial part of the design process. Our participants were receptive to exploring the ideas suggested by disabled people from prior work [92], such as approaching disability organizations and utilizing social media platforms. However, we realized there is still much progress to be made.

First, it would be advantageous for digital designers to go through some training or education to ensure they are prepared and do not exploit disabled user testers. Even though in our interviews P15 (Urban, USA) said going through a disability organization "*just feels a little bit safer*" she was conscious of how such an approach could be perceived negatively due to concerns that digital designers may be viewed as taking advantage. P13 (Rural, USA) also raised concerns about disabled people getting tired of being asked common questions. It suggests opportunities to provide more guidance on how designers can approach this. To alleviate possible tensions, it would be important to establish a system for designers to use that guides them through how to approach the topic and possibly to provide examples of compensation options as well as making this flexible so that the company and disabled people/organization can decide how to keep both parties satisfied. Designers should exhaust the use of guidelines such as WCAG first to meet a standard level of accessibility. Then discussions with designers can focus the conversation on more intricate questions about accessible design.

Second, one of our participants felt that using social media platforms would be an easy and low-cost means of making contact and suggested that disabled people make their disability status known. Although this was in the context of a page dedicated to disabled people who would be evaluated, the sensitivity around this topic in terms of publicly disclosing disabilities should be led and refined by disability communities and not non-disabled people.

5.2.3 Large vs. Individual Workforce. Often, designers from larger companies have separate departments that work on accessibility research and implementation. On the other hand, freelance and self-employed designers are under-resourced. However, we find that there is nuance among those different situations—that is to say, designers in large companies can still face challenges (e.g., bosses who override accessible design decisions), which might not be experienced by freelance and self-employed designers because they work alone. Although, this is not to say that accessible design is more likely to occur among freelance and self-employed designers. Both individuals and organizations can be motivated to implement accessible design, but various factors can make it a challenge.

Large companies are making efforts to lead with accessible design and share resources (e.g., Microsoft's Inclusive Design Toolkit). We did find that large companies offer accessibility training or are more likely to have accessibility champions, which supports the findings of prior work [4]. However, those opportunities are not reaching freelance and self-employed designers. It could be beneficial for large companies to allow freelance and self-employed designers to participate in some capacity.

P11 (Rural, Nigeria) provided an example of a community-based solution to support local workers in the form of space to do their jobs. This idea can be extrapolated to make for a more inclusive and supportive network for accessible design. It might be a hard sell since larger companies will

not necessarily get any return. However, funding initiatives could be set up for under-resourced designers to apply for, which can then be used to pay companies a fee. We recommend that large companies aim to connect more with smaller, remote communities and organizations such as Design Without Borders (designwithoutborders.com). The additional benefit of going this route rather than relying on online courses is the potential to establish a long-term support network. These experiences would likely fall under the term of community of practice [43]. Furthermore, prior work has demonstrated the benefit of online communities among related professions such as graphic designers [57] and UX practitioners [39] for developing practice and professionalization, thus suggesting that supporting more community-focused opportunities for accessible design would be both advantageous and useful.

Our participants also discussed taking the client's lead for project scope instead of exploring negotiations for including accessibility as part of the project timeline (and cost). As highlighted by P12, digital designers in small businesses—or even self-employed—may find this challenging. We may be looking at a situation where we need to increase efforts to educate clients rather than designers about the importance and value of accessible design. In this way, we hope the client wants accessible design to become an expected part of the project requirements when working with digital designers.

5.2.4 Making accessibility information and support commonplace. Some of our participants did receive formal education training toward their design career, but it was clear that accessibility is not something guaranteed, which does corroborate prior work [14, 83]. Technical careers often have a learn-it-on-your-own culture [14], and we found our digital design participants were no different. Three of our participants transitioned to a design career after studying for a different degree. Efforts must be directed to all of the online courses and information. We acknowledge that this would be a considerable undertaking. However, more people are taking advantage of online resources to train for a design career, and accessibility education must be present. Perhaps establishing an accreditation system big tech firms recognize would motivate developers of online courses to include accessible design if it is a required component to secure accreditation.

Informational resources could also help motivate a change in perception about the return of investment for accessible design. Some designers and organizations feel that disabled people represent too small a population to justify potential accessible design costs. P1 (Urban, India) said accessible design is not done because his company's userbase does not include disabled people. There are issues with this view for several reasons: 1 billion people worldwide have a disability [107], planning for accessibility early in the design process will be cheaper than fixing inaccessible systems after release [44], and many nondisabled people can benefit from accessible design when experiencing situational impairments (e.g., bumpy, bright, noisy environments) [109]. We hope our other recommendations seeking to increase connection with disabled people and disability organizations will also shift perceptions to the many benefits of accessible design.

There are often different goals between the wider organization and individuals working on tasks for the organization. These tensions can be exacerbated during remote work because there is no shared physical location. Gutwin and Greenberg [23] explored the creation of digital systems that could support both individual needs and workspace awareness among the team. If we are to support designers in a way that can increase awareness about the progress of accessible design within current projects, as well as finding way to share this with remote disabled people, then it could be an interesting way to increase focus on accessibility at different levels. Prior work has also emphasized the benefits of incorporating accessibility support features within design tools [4, 93, 95]. One of our participants even discussed wanting to see all design tools include accessible checking features. However, it becomes crucial when we reflect on the experiences of

some of our participants. Suppose under-resourced digital designers are unlikely to benefit from or have access to other recommendations to increase accessible design (e.g., in-person user testing). In that case, those designers will still use standard, industry-standard design tools because those are necessary for completing their work. Therefore, industry and researchers must improve design tools to provide built-in guidance on accessible design.

P1 did suggest that digital designers could explore podcasts by disabled people. There are disability podcasts (e.g., FSCast- Freedom Scientific's official podcast), as well as disabled social media stars who advocate for accessibility and explain how they use technology (e.g., Rikki Poynter[5], Tommy Edison[6]). These are low-cost solutions, but more effort may be needed to point designers to those resources. Digital designers and firms could familiarize themselves with this content to influence change in attitudes and perceptions toward the value of accessible design.

5.3 Limitations and Future Work

Due to the COVID-19 pandemic, we had to advertise our interviews online and conduct all of the interviews through Zoom. Some participants from rural areas had unreliable internet connections where their voices kept breaking, or they got disconnected. Although this limited the elegance of how those interviews were conducted, we managed those few disconnections by switching off video feeds and turning-on live transcripts to facilitate better communication. On a more reflective note, those experiences gave us a personal insight into how challenging it would be for those digital designers if they were to conduct online evaluations with disabled people.

Our study aimed to understand the concerns and unique challenges faced by digital designers as mediated by design job support structures and their varying education backgrounds, and we uncovered novel findings. We recognize that some of our interview participants' challenges can be linked to the remote work constraints due to the COVID-19 pandemic and may disappear when returning to the office. However, we want to stress that many parallels to the pandemic can be found with other situations on both a localized or large scale, resulting in switching to remote work (e.g., office fires and earthquakes). Therefore, our findings could apply to digital designers working in situations we did not come across in which they work in atypical contexts. We would also like to explore this more in future work through a large-scale survey.

Finally, we discussed the benefit of building accessibility features into design tools since all digital designers use design tools. However, we do not know what differences there may be for an individual designer compared to a designer working for a large company. It is likely they could use a similar primary tool (e.g., Sketch, Adobe XD). However, for a designer in a large company, there are likely other collaborative tools that find their way into the design process to support the fast-moving workplace with multiple stakeholders and employees.

6 CONCLUSION

Our research showed that the contexts in which digital designers are working (i.e., their design job support structure) and how they gain their design experience would affect their ability to fulfill accessible design requirements. Our analysis revealed that there are many nuanced factors related to a digital designer's workplace support structure that makes it challenging to create accessible content. These factors must be considered so that we continue to develop solutions for increasing accessible design that benefit all designers. We expect to see an increase in accessible design if resources are created to cater to the different situations of digital designers. We recommend that 1) effort is directed toward supporting designers working in different geographical settings, 2)

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[5]https://www.youtube.com/user/rikkipoynter
[6]https://www.youtube.com/channel/UCld5SlwHrXgAYRE83WJOPCw

procedures are established to guide digital designers who want to connect with disabled people for accessibility evaluations, 3) larger companies continue to lead the field by exploring more opportunities to engage with freelance and self-employed digital designers so they have access to accessibility advocates and training materials, and 4) accessibility information and support is embedded in all types of design tools and alternative educational resources.

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