"I Kept Browsing and Browsing, But Still Couldn't Find the One": Salient Factors and Challenges in Online Typeface Selection

Y. Wayne Wu [1], Michael Gilbert [2], and Elizabeth Churchill [3]

[1] University of Illinois at Urbana-Champaign, Champaign IL 61801, USA
[2] Google Inc., New York NY 10011, USA
[3] Google Inc., Mountain View CA 94043, USA
lncs@springer.com

Abstract. Web fonts quickly gained popularity among practitioners. Despite their wide-spread usage and critical role in design, there is a lack of empirical research regarding how practitioners select web fonts and what problems they encounter in the process. To fill this knowledge gap, we took a mixed-method approach to examine the salient factors and common issues in the typeface selection process. To understand the landscape of the problem, we first analyzed adoption data for Google Fonts, a representative online fonts directory. Then, we interviewed practitioners regarding their experience selecting web fonts and the problems they encountered. Finally, we issued a follow-up survey to validate the qualitative findings. Our study uncovered how practitioners operationalized three salient factors --- affordability, functionality, and personality --- in the typeface selection process. Participants reported difficulty in finding typefaces that satisfy the functionality and personality needs. We discuss patterns that led to this difficulty and offered practical design guidelines that alleviated the identified issues.

Keywords: Typeface Selection, Tools for Design, Empirical Study.

1 Introduction

Typeface plays a critical role in design. In online environments, web fonts allow practitioners to deliver the ideal user experience perfectly as designed without burdening users with installing required fonts. Widely welcomed by platform designers, billions of users read web fonts every day [29]. Because of this popularity, the number of web typefaces has risen quickly in recent years. Google Fonts alone, one of the most popular font directories, offers nearly one thousand typefaces in various styles. However, this surge in web fonts makes typeface selection a more tedious process than it was a decade ago when there was only a handful to choose from. To make the matter worse, evaluating potential typeface candidates also takes time. An ideal typeface complements the graphics and text on a web page to fulfill a preset purpose. To find the typeface most suitable for their design needs, practitioners must browse through hundreds of potential candidates and scrutinize the subtle differences among them. Despite the popularity and

the critical role typefaces play, empirical research regarding how practitioners select typefaces is scarce in the HCI community.

To fill this knowledge gap, we designed a mixed-method approach to study practitioners' experience in selecting web typefaces. Specifically, we identified salient factors and the obstacles practitioners frequently encounter in the selection process. Also, we sought to uncover patterns in the typeface adoption process, such as herding behaviors. In this work, Google Fonts serves as a reference point that helps us to understand the problem space. We interviewed practitioners regarding their general online design and typeface selection process. Participants use Google Fonts as a concrete example to describe the shortcomings of existing tools and desired functions. We followed up with a survey to validate the generalizability of the qualitative findings.

Our results show that three factors played vital roles in participants' typeface selection process: affordability, functionality, and personality. As typeface selection is a critical step in the broader design process, which includes many parts that influence each other dynamically, the requirement for each factor in typeface selection constantly changes based on business and design needs. Participants found it challenging to meet these ever-changing requirements and found the support from existing typeface selection tools insufficient. The survey results confirmed the qualitative findings. Participants also reported the functionality and personality requirements were significantly harder to satisfy than affordability.

In summary, our work makes three main contributions: (a) we reported how practitioners operationalized three salient factors in typeface selection process and validate the generalizability of the findings via a large-scale survey study; (b) we uncovered common difficulties practitioners face in the process; and (c) we offered practical design guidelines that addressed the identified problems.

2 Related Work

Prior work has identified the importance of typeface functionality and personality and proposed various ways to measure them. The functionality of a typeface usually depends on the display medium. Typefaces that read well on paper may be illegible on digital screens [1]. Recent technology advancement allowed users to read in new mediums, such as e-ink and augmented/virtual reality displays, but also raised new legibility challenges for typefaces [8,27]. Even on the same medium, the legibility of a typeface may vary depending on screen resolution [4,27], text layout [9,24], text direction [16], font size and type [3,16]. Moreover, practitioners also need to consider accessibility requirements from users with specific conditions, such as dyslexia [22,23] and low vision [25]. While researchers have devised a set of standard test to evaluate a specific font within a given display environment [28], it is still time-consuming for practitioners to run these tests for all potential typeface candidates.

Typefaces have personalities reflected in their emotional connotations. Reading the same text rendered in different typefaces triggers different emotional reactions and influences the reading experience [5,13,18,19]. Prior work shows users tend to reach a consensus about associations between specific typefaces and personality traits [15,17].

At a high level, the design family of a typeface, e.g. serif, san serif, etc., also associates with the perceived personality of the typeface [26]. Accurately assigning emotional connotations for a large set of typefaces is more labor-intensive. O'Donovan et al. built a crowdsourcing system to facilitate this process [20]. However, there is still no widely accepted taxonomy for emotional connotations of typefaces in real-world settings. Furthermore, participants in our study expressed the need to connect the typeface personality with business needs; popular online platforms provide no support for this function. Prior research has also explored innovative ways to display fonts that convey emotional connotations, such as using animation in kinetic fonts [14]. While the participants in our study did not request this specific feature, many expressed the desire to modify existing fonts to meet their personality needs.

Researchers have explored how practitioners make design decisions in real-world settings. Prior research found that design firms invest a significant amount of resources in well-studied methods to facilitate decision-making, such as building user personas to inform design decisions [12]. However, real-world practices are occasionally disconnected from design theories. Prior work found that novice designers were frequently well versed on user-centric design theories, but in practice, they seldom relied on related theories to make design decisions [10] or had misconception regarding how users perceive specific fonts [2]. Instead, they often made decisions without referencing related user research data [11]. This disconnection may be caused by the fast-paced and limited-resource nature of the tech industry. In our study, we proposed platform design guidelines that could narrow this gap and make it easier for practitioners to follow related design theories while selecting fonts.

3 Study Background

To understand the landscape of the problem, we started our study by analyzing the adoption trends of Google Fonts. The analyses were conducted over the HTTP Archive datasets [30]. The archive collects traffic rank and external request data twice a month for the 500k most popular sites ranked by Amazon Alexa [31]. Sites with frequent requests sent to `fonts.googleapis.com` or `fonts.gstatic.com` were considered as adopters. Data for several dates were missing from the original HTTP Archive dataset and thus excluded from the analysis.

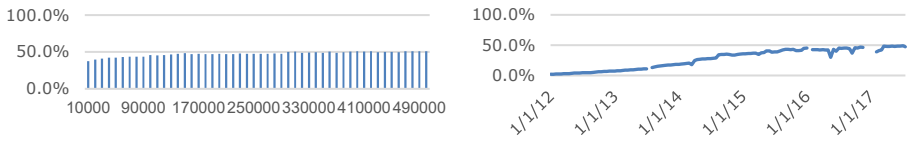

Fig. 1a. (left) Google Fonts adoption rate (vertical axes) across Alexa rank ranges (horizontal axis); **1b.** (right) Historical adoption rate trend.

Our results showed that web fonts were adopted pervasively across sites in different rank ranges. Figure 1a shows the percent of sites that adopted Google Fonts across

Alexa ranks as of August 2017. It appeared that there was no strong association between the site rank and the likelihood of adoption. Approximately half of the sites adopted Google Fonts across rank ranges. Figure 1b shows the historical trend of the adoption rate, which grew steadily and reached 47.5% as of July 2017. As Google Fonts provided half of the fonts on the Internet, the problems we uncovered were representative and pervasive across tiers of web services.

4 Qualitative interview

In this section, we report salient factors and noticeable patterns in typeface selection.

4.1 Methodology

We conducted interviews with 10 practitioners who had direct experience in selecting fonts for a public facing mobile app and/or website. We recruited a diverse set of participants to gain a comprehensive understanding of the typeface selection process. The 10 participants (4 females, 6 males) had different roles (4 designers, 3 design managers, 3 engineers with design experience), different experience levels (two years to three decades of experience), and worked in companies of different sizes (three worked for early-stage startups or in freelancing, four worked for companies with fewer than 100 employees, three worked for companies with more than 100 employees). Qualified participants were contacted via email and compensated $125 for the interview. Two authors conducted the interviews in English at a user research lab in San Francisco. A pilot study with two non-participant designers helped us to devise the interview script. During the sessions, participants answered questions regarding their experience with typeface selections and the issues they had encountered. We transcribed and analyzed the interviews in a grounded theory approach [6].

4.2 Results

We found a typeface was evaluated using three salient factors: affordability, functionality, and personality. As prior work has explored typeface functionality and personality, below we report only the novel findings that complement prior work.

Salient Factor #1 Affordability. While prior work rarely discusses the cost of a typeface in the context of online design, participants repeatedly emphasized the limitation of funds and how it influences their typeface selection. Premium typefaces would be excluded from consideration because of monetary cost. As one participant in a management role said: "*If we have a marketing budget that is unlimited, and my designer came to me and made a compelling case about a font selection. And that's something we have to pay for. Probably I'll give him what he wanted. But the mission for this company is to run as lean as possible, so we would never have this discussion.*"

A typeface may also be unaffordable even it is free. Participants found some typefaces costly because of the amount of engineering required. One participant stated while

the designers in her company disliked the in-use typeface, they lacked the engineering resources to update the outdated infrastructure to support modern web fonts. A company might also be reluctant to change fonts because it is too expensive to replace the existing ones. One participant said the official typeface for their company had been used for many years and changing it would require them to discard existing printed marketing materials, which they could not afford.

Salient Factor #2 Functionality. Participants emphasized that a functional typeface should be legible across different platforms. In addition, we also found participants strongly desired typefaces that were efficient in development cycles. A functional typeface should be rendered in the same way by design software (e.g., Photoshop or Sketch) as by the Internet browsers on the user end. Inconsistency between software environments often increased friction across functions. One engineer participant said: "*When [designers] pick bad ones [typefaces], they may look yucky in browser. I spent too much time explaining to designers the difference between [what you see in] Photoshop and what you see on screen and websites."*

While participants recognized the importance of typeface functionality, they often found it very time-consuming to evaluate the legibility of typeface candidates. The problem was more acute for small to medium size companies because of resource scarcity. The design team often did not have time to conduct rigorous evaluations. As a result, participants chose to blindly trust online typeface directories hoping the offered typefaces had already passed strict legibility tests.

Salient Factor #3 Personality. While understanding typefaces had different emotional connotations, participants often struggle to find the typeface that most suitable for the business needs and yet consistent with the product/brand image. One participant from a financial services company emphasized the importance of a "professional" typeface; another participant from a social community company preferred more "active" typefaces. Practitioners needed to adopt a design style associated with the public perception of their industry sector. On the other hand, practitioners also needed to differentiate themselves from their competitors. One participant said he intentionally avoided using the most popular typefaces to deliver a unique impression.

Even when participants knew exactly what impression they wanted to deliver, they still had a difficult time finding the ideal typeface. One participant said: "*When I'm looking for a particular font, you know what feeling you want the font to have. But I just spent so much time browsing and browsing, and still couldn't find the one."* Online directories provide common typeface categories (serif, sans serif, etc.) and filters (by thickness, width, etc.) to facilitate the search. However, as design trends and business needs shift constantly, it was still challenging to find the ideal typeface.

Weak Herding Behavior. One consideration at the outset of this research was to determine whether popular typeface choices would influence practitioners' typeface selection and to what degree platform designers should emphasize popular choices. Our results showed weak herding behavior in the selection process. Participants reported

visiting various sources, such as blogs, newsletters, and magazines, to collect design examples. Later, they would incorporate elements gleaned from these sources into their design rather than directly mimicking the sources. Even design recommendations from trustworthy sources needed to be critically evaluated. One participant said: "*If a really good designer friend of mine shows me a design that makes no sense, I'll be like I know that person is a good designer, maybe there is something I don't know … depending on the experience of the designer, I may put more thought in it.*"

We found that participants would not blindly follow their peers or other design sources. They might take recommendations from trusted sources into consideration, but they still wanted to spend significant effort in searching for suitable typefaces.

Inability to Adjust Typefaces. After participants expressed frustration in finding the ideal typeface, they indicated their desires to "slightly tweak" the typefaces. Sometimes, participants could find a typeface that partially fulfilled their needs but was "just a little bit off." Existing tools for crafting typefaces were mainly designed for experienced typographers. Participants worried that their adjustments might lead to typeface quality issues, such as lowering the aesthetic value and legibility of the typeface. Practitioners with less experience in typefaces might benefit from a tool that supports a moderate amount of adjustment to typefaces without causing significant quality issues.

5 Survey study

After the qualitative study, we ran a survey to gauge the generalizability of our findings.

5.1 Methodology

The survey included three parts. The first part focused on the salient factors in the typeface selection process. For each of the three salient factors, we devised two options covering different aspects of the factor based on the qualitative findings. The second part of the survey focused on herding behaviors. Two questions asked participants about their reactions to typefaces used by design leaders and popular online typefaces. The last part of the survey asked participants about their desire to modify typefaces and the extent to which they would like to do so.

We followed a strict process to recruit participants in Arts and Design professions from Amazon Mechanical Turk. Qualified participants must work as a design professional and have experiences selecting typefaces. We designed the survey in a way that participants had no incentive to misreport their background – all participants received payments regardless of responses; none was aware of the screening either. 37% of the collected responses (144/389) passed the screening and were used in the analysis. Among these, 41.6% had fewer than three years of design experience, 20.8% had more than three and fewer than five years, and 37.5% had more than five years of experience. 63.2% of the participants have made a typeface selection for at least once and the rest 36.8% have participated in such a process. All participants resided in the U.S.

Table 1. Ratio of participants who valued different salient factors. For the mean effort invested in the search, values (max=5) with different superscripts are significantly different. Participants spent significantly more effort searching for functional and personal typefaces than for affordable ones.

Factor	Statement	Perc.	Effort (std.)
affordability	Engineering wise, it is very easy to implement the new typeface.	20.1%	2.69^{a} (0.96)
	The typeface has a low price or comes free.	29.2%	2.79^{a} (0.89)
functionality	The typeface is rendered the same across platforms and software.	41.7%	3.33^{b} (1.07)
	The typeface reads well in different sizes and weights.	48.6%	3.24^{b} (0.82)
personality	The typeface conveys a feeling that fits well with my design style.	62.5%	3.41^{b} (0.99)
	The typeface has a consistent feel with the product/brand image.	64.6%	3.42^{b} (0.97)

5.2 Results

More than half the participants viewed personality as an important factor in the typeface selection process, and approximately half the participants viewed functionality as important (Table 1). Fewer participants selected affordability as an important salient factor; this might be caused by the bias in the participant pool towards design professionals. Although in a real-world setting, practitioners might only be able to use typefaces that fit the budget, they viewed the other two factors as being more important in the selection process. On a 5-point scale, participants reported spending significantly more effort searching for typefaces that met the functionality and personality requirements than they did for affordability.

Consistent with the qualitative findings, few participants said they prefer to use typefaces used by design leaders (6.9%) or popular typefaces (9.0%). Significantly more participants said they tried to learn why a typeface was used by design leaders (36.1%) or why it was popular online (38.2%) and then selected typefaces using the same principles. A similar number of participants did not value typefaces used by design leaders (39.6%) or popular ones (34.0%) more than other typefaces. The rest of the participants had negative opinions about typefaces used by design leaders (17.2%) and popular ones (18.7%). Most participants would consider the typefaces recommended by design leaders and popular opinion, instead of blindly making the same selection. Overall, participants showed a weak herding behavior in the typeface selection process.

Most participants were interested in tools that allow them to create new typefaces (25.7%) and make changes to existing typefaces (68.7%). 28.5% expressed interests in making major changes, such as creating new characters; 30.6%, medium changes, such as revising part of a character and adjusting height/width; and 9.7%, minor changes, such as adjusting kerning and font weights. Only 5.6% of the participants said they had no interest. These results were consistent with our earlier qualitative findings.

6 Discussion and Recommendations

Our results showed practitioners often struggle to find typefaces that met the functionality and personality needs. Instead of imposing the burden on practitioners, online typeface directories could offer more legibility information to facilitate the search, such

as recommended font sizes based on standard tests [28] or typefaces accessible to people with disabilities (e.g. dyslexia [21], low vision [25], etc.). In terms of costs, it is relatively inexpensive for platform designers to evaluate typefaces, especially when compared to the cost of creating new ones. Web font providers could also share font usage data to empower practitioners to make more informed decisions, such as the up-to-date distribution of screen sizes or display mediums.

Regarding typeface personality, platform designers should consider offering more up-to-date recommendations. Existing platforms, including Google Fonts, Font Squirrel, offer curated typeface collections based on style and personality [32]. Prior work has also explored using online crowds to label typeface personality [20]. Platforms offer the same static collections for years and rarely update them. However, our results showed practitioners often selected typefaces in response to the ever-changing design trends within the industry sector. Platform designers could provide more present font usage data in different industry sectors to empower practitioners. Alternatively, practitioners may benefit from context-aware typeface recommendations. Prior work has explored algorithms that recommend typefaces for image pairing [7]. As practitioners usually make service-wide typeface selections beyond the scope of one single image, future research could explore the possibility of recommending typeface pairings based on the content, image, together with other design elements.

Participants expressed strong interests in adjusting and creating typefaces when they couldn't find an ideal one. Platform designers may consider offering such features as a last resort for practitioners after an unfruitful search. On the other hand, while the interest was strong, participants worried misadjustment might reduce the typeface's legibility or aesthetic appeal. In recent years, some tools have started to support parametric typeface creation [33,34]. However, such tools do not yet offer quality-checks for the typefaces created. Platform designers could offer ways to quickly assess the functionality and personality of a new typeface in an affordable way, such as using online crowds. Participants also expressed their desire to change an existing typeface. Future work could explore parametric ways to modify typefaces in addition to creating new ones.

7 Conclusion

Our research makes three contributions: (a) we provided empirical evidence regarding how practitioner operationalize salient factors in their typeface selection and validated the generalizability of our findings via a survey; (b) our mixed-method study uncovered the difficulties practitioners frequently encountered in this process; and (c) we offered practical design guidelines that alleviated the identified issues for platform designers. We envision a future where our findings help platform designers to improve the user experience of typeface browsing, to help practitioners make more informed typeface selections, and ultimately, to build a more functional and more personal Internet.

References

[1] Ahmad Zamzuri Mohamad Ali, Rahani Wahid, Khairulanuar Samsudin, and Muhammad Zaffwan Idris. 2013. Reading on the Computer Screen: Does Font Type has Effects on Web Text Readability? *Int. Educ. Stud.* 6, 3 (January 2013), 26–35. DOI:https://doi.org/10.5539/ies.v6n3p26

[2] David Bartram. 1982. The perception of semantic quality in type: Differences between designers and non-designers. *Inf. Des. J.* 3, 1 (January 1982), 38–50. DOI:https://doi.org/10.1075/idj.3.1.04bar

[3] David Beymer, Peter Z. Orton, and Daniel M. Russell. 2007. An Eye Tracking Study of How Pictures Influence Online Reading. . 456–460. DOI:https://doi.org/10.1007/978-3-540-74800-7_41

[4] Dan Boyarski, Christine Neuwirth, Jodi Forlizzi, and Susan Harkness Regli. 1998. A study of fonts designed for screen display. In *Proceedings of the SIGCHI conference on Human factors in computing systems - CHI '98*, 87–94. DOI:https://doi.org/10.1145/274644.274658

[5] Heloisa Candello, Claudio Pinhanez, and Flavio Figueiredo. 2017. Typefaces and the Perception of Humanness in Natural Language Chatbots. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems - CHI '17*, 3476–3487. DOI:https://doi.org/10.1145/3025453.3025919

[6] Kathy Charmaz. 2006. *Constructing grounded theory: A practical guide through qualitative analysis* (1st ed.). SAGE Publications, Inc., London.

[7] Saemi Choi, Kiyoharu Aizawa, and Nicu Sebe. 2018. FontMatcher. In *Proceedings of the 2018 Conference on Human Information Interaction&Retrieval - IUI '18*, 37–41. DOI:https://doi.org/10.1145/3172944.3173001

[8] Michele Di Donato, Michele Fiorentino, Antonio E. Uva, Michele Gattullo, and Giuseppe Monno. 2015. Text legibility for projected Augmented Reality on industrial workbenches. *Comput. Ind.* 70, (June 2015), 70–78. DOI:https://doi.org/10.1016/j.compind.2015.02.008

[9] Mary C. Dyson. 2004. How physical text layout affects reading from screen. *Behav. Inf. Technol.* 23, 6 (November 2004), 377–393. DOI:https://doi.org/10.1080/01449290410001715714

[10] Erin Friess. 2008. Defending design decisions with usability evidence: a case study. *CHI EA '08 CHI '08 Ext. Abstr. Hum. Factors Comput. Syst.* (2008), 2009. DOI:https://doi.org/10.1145/1358628.1358631

[11] Erin Friess. 2010. Designing from data: Rhetorical appeals in support of design decisions. *J. Bus. Tech. Commun.* 24, 4 (2010), 1–42. DOI:https://doi.org/10.1177/1050651910371197

[12] Erin Friess. 2012. Personas and decision making in the design process. *Proc. 2012 ACM Annu. Conf. Hum. Factors Comput. Syst. - CHI '12* May 2012 (2012), 1209. DOI:https://doi.org/10.1145/2207676.2208572

[13] Kevin Larson, Richard L Hazlett, Barbara S. Chaparro, and Rosalind W Picard. Measuring the Aesthetics of Reading. In *People and Computers XX — Engage*. Springer London, London, 41–56. DOI:https://doi.org/10.1007/978-1-84628-664-3_4

[14] Joonhwan Lee, Soojin Jun, Jodi Forlizzi, and Scott E. Hudson. 2006. Using kinetic typography to convey emotion in text-based interpersonal communication. In *Proceedings of the 6th ACM conference on Designing Interactive systems - DIS '06*, 41. DOI:https://doi.org/10.1145/1142405.1142414

[15] Ying Li and Ching Y. Suen. 2010. Typeface personality traits and their design characteristics. In *Proceedings of the 8th IAPR International Workshop on Document Analysis Systems - DAS '10*, 231–238. DOI:https://doi.org/10.1145/1815330.1815360

[16] Hsuan Lin, Fong-Gong Wu, and Yune-Yu Cheng. 2013. Legibility and visual fatigue

affected by text direction, screen size and character size on color LCD e-reader. *Displays* 34, 1 (January 2013), 49–58. DOI:https://doi.org/10.1016/j.displa.2012.11.006

[17] J. Mackiewicz and R. Moeller. 2005. Why people perceive typefaces to have different personalities. In *International Professional Communication Conference, 2004. IPCC 2004. Proceedings.*, 304–313. DOI:https://doi.org/10.1109/IPCC.2004.1375315

[18] Gary R. Morrison. 1986. Communicability of the emotional connotations of type. *Educ. Commun. Technol.* 34, 4 (1986), 235–244. DOI:https://doi.org/10.1007/BF02767404

[19] Shoko Nakahata, Emiko Sakamoto, Akiho Oda, Noriko Kobata, and Sho Sato. 2016. Effects of color of book cover and typeface of title and author name on gaze duration and choice behavior for books: Evidence from an eye-tracking experiment. *Proc. Assoc. Inf. Sci. Technol.* 53, 1 (2016), 1–4. DOI:https://doi.org/10.1002/pra2.2016.14505301100

[20] Peter O'Donovan, Jānis Lībeks, Aseem Agarwala, and Aaron Hertzmann. 2014. Exploratory font selection using crowdsourced attributes. *ACM Trans. Graph.* 33, 4 (July 2014), 1–9. DOI:https://doi.org/10.1145/2601097.2601110

[21] Luz Rello and Ricardo Baeza-Yates. 2013. Good fonts for dyslexia. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility - ASSETS '13*, 1–8. DOI:https://doi.org/10.1145/2513383.2513447

[22] Luz Rello, Ricardo Baeza-Yates, Laura Dempere-Marco, and Horacio Saggion. 2013. Frequent Words Improve Readability and Short Words Improve Understandability for People with Dyslexia. In *Human-Computer Interaction INTERACT '97*, Steve Howard, Judy Hammond and Gitte Lindgaard (eds.). Springer US, Boston, MA, 203–219. DOI:https://doi.org/10.1007/978-3-642-40498-6_15

[23] Luz Rello and Simone D J Barbosa. 2013. Do People with Dyslexia Need Special Reading Software? In *Human-Computer Interaction – INTERACT 2013, Workshop on Rethinking Universal Accessibility: A broader approach considering the digital gap*.

[24] Luz Rello, Martin Pielot, and Mari-Carmen Marcos. 2016. Make It Big! In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems - CHI '16*, 3637–3648. DOI:https://doi.org/10.1145/2858036.2858204

[25] Elizabeth Russell-Minda, Jeffrey W. Jutai, J. Graham Strong, Kent A. Campbell, Deborah Gold, Lisa Pretty, and Lesley Wilmot. 2007. The Legibility of Typefaces for Readers with Low Vision: A Research Review. *J. Vis. Impair. Blind.* 101, 7 (July 2007), 402–415. DOI:https://doi.org/10.1177/0145482X0710100703

[26] A. Dawn Shaikh, Barbara S Chaparro, and Doug Fox. 2006. Perception of Fonts: Perceived Personality Traits and Uses. *Usability News* 8, 1 (2006), 1–6. DOI:https://doi.org/10.1103/PhysRevD.48.3160

[27] Benjamin Smith and Terra David Groenewold. 2018. Developing a Typeface for Low Resolution E-Ink Displays. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems - CHI '18*, 1–6. DOI:https://doi.org/10.1145/3170427.3180306

[28] Jean-Luc Vinot and Sylvie Athenes. 2012. Legible, are you sure? In *Proceedings of the 2012 ACM annual conference on Human Factors in Computing Systems - CHI '12*, 2287. DOI:https://doi.org/10.1145/2207676.2208387

[29] Analytics - Google Fonts. Retrieved April 7, 2019 from https://fonts.google.com/analytics

[30] HTTP Archive. Retrieved April 7, 2019 from http://httparchive.org/

[31] AWS | Alexa Web Information Service. Retrieved April 7, 2019 from https://aws.amazon.com/awis/

[32] Featured Collections - Google Fonts. Retrieved April 7, 2019 from https://fonts.google.com/featured

[33] Prototypo | Design custom fonts that perfectly fit your needs. https://www.prototypo.io/.

[34] Variable Fonts. Retrieved April 7, 2019 from https://v-fonts.com/