Legibility in typeface design for screen interfaces

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Master's Thesis

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Abstract

This thesis explores the considerations related to the design of a typeface specifically for the use in interface typography. The genre of interface typefaces is outlined and essential attributes and requirements of this category of typefaces are inspected from the viewpoints of legibility, readability and type design practices. The research is based on the analysis of interface typeface samples, interviews with type designers as well as empirical findings documented by designers. These trade practices and design artefacts are contrasted with findings from cognitive psychology and legibility research. Furthermore the author's design of the «Silta» typeface and its creation process are used to scrutinize and validate these observations.

Amongst the crucial factors in the design of interface typefaces the legibility of confusable characters is extensively analysed. Furthermore, the rasterized on-screen rendering of outline based fonts is identified as a major contributing factor requiring special attention in the design, technical production and testing phases of modern fonts. Additionally, the context and use of interface typography and how users interact with interfaces are identified as the cornerstones influencing the design decisions of a typeface for this use.

Finally, the aesthetics of interface typography and the motivations for developing specific interface typefaces are touched upon. As evident from the reviewed material, branding and visual identity often appear to be a driving force in the creation of new interface typefaces. However, the necessity for technological innovation and its demonstration equally inspire new design solutions. While technological limitations stemming from digital display media are increasingly becoming of less importance, the changes in reading behaviour and adaptive typography drive current development.

Keywords Typeface design, Legibility, Readability, User interface, Typeface

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1 Introduction

There is a astounding number of typefaces in existence today[1] — and thousands of new ones are launched every year. Digital production and distribution result in a market that is booming with new designs available for a wide range of use cases. Looking at this overwhelming volume of choices unwillingly the question arises why new typefaces are needed altogether. Sometimes referred to as an art, sometimes as a craft, the design of letters has fascinated artisans, printers and publishers ever since the invention of movable metal type some six hundred years ago. Printed type is also a descendant of handwritten letters. Like all humans have unique writing hands, typefaces equally give expression to a multitude of moods and emotions. Graphic design icon Massimo Vignelli famously advised the use of only a handful of timeless typefaces[2]. Despite this amiable promotion of the excellent typographic quality in these faces he regarded as essential, the realities of typography often call for distinction, functionality and relaying a broader range of emotions. New typefaces are born out of necessity, when no existing design fulfils the requirements or aesthetic vision for the job at hand. Invariably, they are also born out of sheer curiosity and designers' never ending eagerness to explore new forms. And as history has repeatedly shown, novel typefaces are conceived out of the limitations and requirements that presents themselves from technical innovation. Just like movable type transformed the calligraphy of scribes and the inscriptions of stone masons into letters cast from molten lead, the evolution of reading habits, different media and itself typeface production generates new approaches to designing the same eternal letters.

That we are now faced with typographic choices that are beyond comprehension speaks not of a decline in quality. Not exclusively, at least. It is also testament to the curiosity to explore and find new expression, and to how integral a part of our culture written language in its various forms is. My own journey into type design set off, very contemporary, from the ubiquitous connectivity of the internet and the devices we use to read and navigate textual content in this information age. A pinch of technological innovation, a bit of aesthetic curiosity, and the very distinct typographic requirements of digital screen interfaces are the impulses that motivated this thesis. The design outcome, in form of a new typeface family, is presented, dissected and analyzed in this thesis and displayed in *Appendix I*.

1.1 Purpose statement

This text details the design process of the **Silta** typeface design from an analytical point of view and in retrospect. It elaborates on the background research, aesthetic considerations and design decisions undertaken for

[1] In fact even amongst professionals there is no consensus on even a rough estimate, but the number is clearly in the tens of thousands. And indeed, with all the long lost designs, revisions, obscure designs and sheer flood of volume, it seems impossible even to attempt a count.

[2] Vignelli outlined this view on many occasions, for example see ***Vignelli 2015***.

the design of this interface typeface. The text forms a summary of general considerations for attempting the design of a typeface intended for this particular purpose. Nonetheless, many of the issues touched upon bear merit to other, more general, aspects of type design, such as legibility, readability and aesthetic qualities.

The central argument of this thesis is that avoiding ambiguity is essential to interface typeface design. Eliminating the possibility of misreading is where different aspects of screen readability and legibility, interface typography and attention to the design of minute details converge. The term interface typeface is herein further defined and common attributes of typefaces designed for and used in this context are analysed. As part of the research, type designers Aleksandra Korolkova, Tim Ahrens and Lukas Paltram provided their insights by answering email questionnaires, and Jarno Lukkarila was interviewed on two occasions in Helsinki. Furthermore, exchange with my advisors Saku Heinänen and Teo Tuominen, who are type designers as well, naturally aided my comprehension of this vast topic. These correspondences with practicing type designers have validated the typeface category definition suggested in *chapter 2*.

The presented research takes the viewpoint of a typeface designer, but acknowledges that relevant material ranges from the fields of design research to cognitive psychology and neurological science. With this outlook it is worth keeping in mind that much of the research on legibility and readability referenced is often highly specific to the typefaces used in the respective trials. Only in recent years have type designers and researchers began to thoroughly acknowledge their codependency and devised research in cooperation. The research reviewed herein is further accompanied by examples of other recently published typeface designs. The analysis of these specimens attempts to deduct the approach their designers took.

One of the criteria every new typeface design is evaluated against is its necessity. With nearly six centuries of evolution in type design, the question why indeed we need new typefaces to supplement the existing range appears justified. Innovation in print and display technology have throughout history prompted new designs, but also modern ways of reading and typesetting encourage progress. How we use text to structure and communicate with the help of written language is always adapting to the changes in society and culture. In light of this, it would be a disservice to users and readers to simply rely on, and re-purpose, existing typefaces and their rationales to interfaces in screen devices. While the process of reading and the transfer of information is always at the heart of designing typefaces, new media and new technology require fresh consideration – forms that follow function.

Equally the liberation of desktop publishing, digital fonts and web publishing have democratized the used of type. In place of typographic dogma and convention are experimentation and subjective assessment. While this thesis offers analysis and description of the attributes of interface typeface designs, it is eventually the taste and visual considerations of each typographer, no matter how experienced or educated, that determine what is fit for use.

1.2 Methodology

In its methodology this text draws on the analysis of the characteristics of existing typefaces, on a review of professional literature in the field of typography, psychology and interface design. These are contrasted to interviews with professional type designers as well as the empirical experience of the author. As typeface design oftentimes is a process that takes considerable length and works in revisions, one possible avenue of analysis that remains less explored in this text is the comparison of different stages in the development of one typeface, aside from the author's own. In particular, how actual (user) testing and device previewing has influenced designs along the creation process promises to be a fruitful, but highly inaccessible, source of information, since work-in-progress typeface designs are hard to acquire for analysis.

As the gathered information aims to provide an overview of common practices, the cited sources range from academic publications and journals to text books and historical accounts. However, also opinionated essays and more casual guides written by designers for their peers have been deemed to provide valuable insight, since they are a valid documentation of best practices and contemporary trade conventions.

The context of the author's empirical findings from designing a interface typeface are further free from many of the constraints commercial work in the field of type design are subject to. As a self-initiated project with little specific outside limitation, the exploration of the typeface's aesthetics was free to focus entirely on aspects of legibility. The review of other interface typefaces and the discussion on interface typography's role as part of brand communication in *chapter 3.4.1* show how a project with commercial focus has to answer to a different set of constraints.

1.3 Scope of design and analysis

The scope of design work, research and the process analysis presented here are inherently limited to allow for focused results. On a very general level the design and research work presented here is framed by an inspection of Latin based type design and the legibility research of Latin based scripts. Some contemporary and highly ambitious typeface projects relish the implications and challenges of multiple script coverage, and in an increasingly connected world-wide information society this is called for. Focusing this research on only Latin based scripts stems from the necessity of limiting scope, not from a lack of acknowledging this important aspect of modern typeface design.

The term interface, as it is used throughout the text, exclusively refers to on-screen interfaces of digital devices. Naturally interfaces that utilize typography come in many shapes and sizes, and many purely physical interfaces devoid of a digital screen are deliberately excluded from analysis. The types of screen interfaces referred to here in this loose manner still encompasses a range from modern personal computer displays to handheld smart phones. While this is still a tremendously vast array of use cases and display technologies, this does exclude some more specialized forms of interfaces. For example, car navigation displays, signage on large screens, command-line interfaces, bitmap fonts, specialized segment displays, as well as micro sized displays like for smart watches are considered outside of this thesis's scope. All of the aforementioned require a much more specific treatment than reasonably achievable with one typeface or research undertaking alone. However, many of the findings presented bear relevance to those more specialized applications as well as type designs geared towards legibility in general. Indeed, many of the references and insights relied upon in the design and research process are agnostic of the use case as they concern the application of more fundamental typographic considerations; How do glyph shapes affect legibility? Why is a large x-height in typefaces recommended for interfaces? What factors influence readability from screens?

This also prompts a disclaimer that is ingrained in every typographic discussion. While the formulated observations strive to be qualitatively accurate, the practice and craft of typography is always the concrete application to a specific task. Typefaces are relative, in the sense that they are the matter the typographer uses to convey meaning and mood to the reader or user. As such, type designs are always application specific and the interpretation of their effectiveness, legibility and aesthetic value remains subjective to a degree. While this may seem contradictory to the purpose of a research publication, it is the authors view that type design has to be understood as

a craft enabling future use cases and users – the potential that is ingrained in the design, so to say. It is not an absolute art with definitive formulas, solutions or quick fixes.

Furthermore, the practical design of the typeface production also underlies simple economical limitations imposed by the scope of this work in the context of a Master's Degree. The choice of supported character set, language support as well as the extensiveness of the typeface family in terms of styles are chosen in an arbitrary manner for this project. In particular the choice of weights, their distribution and the design of extreme weights for suitableness to this particular type of application are left largely unexplored through analysis, though this is interesting territory for further examination and indeed designs. The production also takes a consciously limited stance by focusing solely on the design of the typeface. Icon sets or a design framework to supplement and showcase the typeface's versatility have to remain plans for future expansion.

As previewed in the conclusive part, the expected introduction of Open Type Variable Fonts may well open up new design avenues. While they address some of the practical issues pointed out throughout the text in a more responsive and user centered way, the market impact of this new format remains to be seen. More essential, however, is to understand the role of interface typography as a product design asset in digital media applications. While legibility is the focal point of this text, issues like the aesthetics and the motivations behind creating new interface typefaces are equally important, but only touched upon in the following chapters.

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2 Introducing the term interface typeface

ILLUSTRATION 1: Example of an early interface typeface, consisting of a monospaced font at a single size.

[3] Outline fonts are based on bezier curves and are resolution independent. Outline fonts for computer displays, however, often included a mix of bitmap and outline information in the form of hinting instructions.

On the outset of this research project the questionable notion of interface typefaces as a distinct category of typefaces seemed bewildering. The history of digital interfaces does not provide any conclusive indication of what such a typeface category might be. Early command line interfaces featured equal width characters, and for practical reasons adopted their aesthetics from typewriters with the similar monospace constraint. Those earliest digital typefaces were not based on mathematical, scalable, vector shapes, but instead consisted of bitmap fonts with per-pixel information. As such, the text layout engines at the time handled single glyphs as units of equal width, akin to a typewriter. The user interfaces of first computer systems with more sophisticated graphical capabilities advanced to using outline fonts[3] and accelerated typographic development for screen media. The reuse of established typographic forms followed, like the adaptation of the neo-grotesque **MS Sans Serif** on Windows or humanist inspired **Lucida Sans** on Mac operating systems. However, the mere use in an interface hardly qualifies those typefaces to represent this genre by default.

Contrary to the initial research assumption of this thesis, the term interface typeface and the characteristics associated with it seem to be widely accepted in typographic circles. Like with other typeface genres a common denominator stems from the application of typefaces with certain properties to a specific task. While many major marketplaces for fonts have top level categories like sans serif, serif, slab serif, many of the more granular categories are not mutually exclusive and often suggestive of possible application[4]. Interface typefaces are almost exclusively sans serif fonts and fall predominantly into the categories of lineal moderns of either neo-grotesque or humanist character (see illustration 2). Many representatives of the genre can at times also be applied as good screen reading faces, signage typefaces or all-round workhorse typefaces.

[4] As of this writing, for example myfonts.com has a category tag for ‹interface› usage, fontshop.com features a curated list of ‹interface fonts›, fonts.google.com, fonts.com and youworkforthem.com only have the sans serif top level category, fontsquirrel.com has no interface specific category despite its range of sub-categories tags

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ILLUSTRATION 2: The two major typeface classifications encountered in interface typefaces, following the ATypI Vox classification (*ATypI*, 2010). LEFT: **Helvetica Neue**, a neo-grotesque typeface. Typical features include closed shapes, even width and little stroke contrast RIGHT: **Frutiger**, a representative of the humanist classification. Typical features include open shapes, capitals referencing classical Roman inscriptions in their proportions as well as a lowercase showing influences of medieval Carolingan script.

Like with other terms used for typeface categorization, the specific parameters interface typefaces include show the result of a formation of conventions. All of the type designers interviewed during the course of this

research seem to agree on most common features, yet in all the answers there is some diversion of what are considered essential traits. An illustrative historical example of how a typeface category forms is that of newsprint typefaces. Parallels can be drawn to interface typefaces. Initially, more or less generic designs are used for a specific purpose, and experimentation establishes the category over a series of trial and error. Through clever ingenuity and appropriating aesthetic trends to a more specific use case new attributes crystallize. After general acceptance of formal aspects the category can further flourish into very specific and highly fine-tuned designs. In the case of newspaper types it was initially identified that the low quality paper stock and high speed and volume printing processes used in these short-lived publications required sturdy features[5]. At the same time, they needed to exhibit good readability, yet also space saving metrics. In present day, newspaper type families are often highly refined and offer headline and caption optical sizes, special colour grades to accommodate different paper stock, or special attention to integrating several scripts into the family. Those typefaces are oftentimes bespoke designs tailored to the particular newspaper's needs[6]. All the while, technological innovation influences and shapes the agreed-upon norm of the category. In this parallel to screen typefaces, the first generation of outline based interface typefaces, such as **Verdana** or **Lucida Sans**, articulated the need for special purpose designs and helped shape the major characteristics. With increasing pixel densities, ubiquitous hand-held devices and the advances of typography for the web[7] further designs are now refining and exploring the category. And increasingly the new designs for interface use are guided by the need to distinguish from the competition, as was equally the case with newspaper types.

In summary thus, the term «interface typeface» seems to be clearly understood in the profession of type designers. What remains unclear is to what degree there is confusion in applying this term between different design disciplines, as merely pointing out a typeface is used as interface typeface can equally refer to simply its use in a design, or in fact refer to its more intricate qualitative aspects.

[5] Features needed to be sturdy to maintain a readable appearance even when ink gain or applied preassure would vary.

[6] For some recent examples, see Kris Sowersby's **Financier** for the Financial Times, Christian Schwarz's and Paul Barnes' **Guardian** for the homonymous newspaper, or Henrik Kubel's design for **The Independent**, to list but a few.

[7] In particular the implementation of the CSS2 font module across browser vendors freed web typography from the restraints of relying on a very limited selection of system fonts.

2.1 Benefits and detriments of categorization

While there is no inherent need to label interface typefaces as such, there are some advantages and disadvantages to doing so. As a brief prelude to outlining some of the actual features of this category the following includes a short discussion of what are the implications of such a categorization.

2.1.1 Arguments against categorization

The categorization of interface typefaces has the potentially detrimental effect of excluding a design from other applications. Applying such a label will shape users' expectations and assumptions on the ideal use cases. And likewise, other designs might not get considered for use in interfaces for lack of such a label in their description. However, the way the «interface» label is used to categorize typefaces on popular online marketplaces is not of this mutually exclusive nature. Or by way of example, just because a typeface has been labelled for interface typesetting will hardly make designers outright ignore it for any other use.

Depending on what is included in the definition of interface typefaces there is the danger that the categorization will be misused mostly for marketing purposes. In our interview *Ahrens* (2016) notes that in an effort to bolster sales or claim a market gap statements regarding screen optimisation are often *"mostly for marketing reasons".* Indeed the design and production quality of typefaces is often hard to attest to even as a designer, let alone as layman customer. When there is little obvious negative impact of applying a label too loosely (the main deterrent might be to appear unprofessional to more sophisticated peers and clients) it is indeed important to scrutinize designs to see if their characteristics do in fact satisfy the understanding of the genre.

From a more purist viewpoint it is of course justified to bring into question the use of such labels and categorizations altogether. Ideally, a typographer judges the suitableness of a typeface to each design task at hand. The question then is if categorization is not superfluous to begin with? While that seems a reasonable request, it is hardly practical. This approach has validity in regard to judging a particular design, but for a typographer in search of an appropriate typeface for a project the booming number of available typefaces is impossible to review. Doing away with categorization altogether based on this line of argumentation would render finding and evaluating typefaces a tedious task indeed.

2.1.2 In favour of categorization

In the context of this thesis, and typographic research in general, defining this label has the obvious benefit of facilitating more precise conversation. Once a term for such types is established, it is easier to discuss variants and properties without confusion. This is in conclusion with *Krippendorff's* (2005, P. 267) understanding of the importance of furthering design discourse on the whole:

> *"No profession, no academic discipline can survive without providing its members the ability to explain themselves to others, continuously improve their proficiency, and demonstrate the benefits they can bring to collaborations with others."*

In particular the reciprocal aspect of discourse is worth noting. It allows designers (and design researchers) to communicate, agree or disagree with each other. For other stakeholders involved in the design process, too, it is important to be able to rely on terms established for clear communication. Type design is not exempt from the detriments of its practitioners maintaining an aura of enigmatic mystery around issues like legibility, design aesthetics and the intricacies of the production work flow. While in the short view this protectiveness of the own domain asserts the type designers' authority, the long view has to be that clients appreciate transparency and satisfying this will be beneficial for both sides. Subsequently, if the researchers and practitioners of the field fail to define their own conventions, it is impossible to constructively communicate with researchers of other fields, clients ordering typefaces, other designers using the typefaces, or indeed the readers at the end of the spectrum.

Furthermore, there seems to be a need for more intricate categorization in order to avoid ambiguity. Many classification systems, like the earlier mentioned Vox classification, are based on a combination of typeface appearance and historical developments. *Cheng* (2006, P. 16) notes that aspects like function, intent and artistic influence are equally relevant, but often absent from such classification schemes. In regards to interface typography the distinction between a neo-grotesque, humanist and a geometric sans serif does not inherently reveal which is better suited for this purpose.

2.2 Common characteristics

A categorization of common features has been attempted by various authors, often in the form of interface designers providing guidelines for picking suitable interface typefaces[8]. The following offers common denominators often mentioned in such empirical benchmarks as well as type design literature. Furthermore, some of these attributes are quantified and to some extent confirmed in the measurements of various interface fonts featured in *Appendix II*.

[8] For example, see *Will-Harris* (2003), *Hex* (2011), *Eden* (2013), *Whited* (2013), *Kennedy* (2014), *Bowler* (2015), *Byttebier* (2015), *Salminen* (2016).

Before embarking on this review, it is worth stressing is the motivation behind those identified attributes as attempted in the following section. This provides more insight than simply listing them as a matter of fact. It also reveals some issues can be tackled with different approaches, while others are influenced by a multitude of overlapping factors. In this inspection of common characteristics the distinction is formally made between factors of readability and legibility, which in their definition adhere to *Tracy* (1986, pp. 30). He describes legibility as the ease with which single letters are identified, whereas readability refers to the comprehension and ease of reading continuous text. Additionally, many aspects are driven mostly by considerations for the screen display medium and its constraints to reproduction fidelity of outline glyphs through rasterization to a pixel grid.

2.2.1 Readability

Interface typography is highly utilitarian in the sense that stylistic choices in the design of such typefaces often are of inferior importance when compared to functional considerations. As such, the readability of text is generally more important than its stylistic inventiveness. Unlike branding or display typography, where the type is essential part of the visual communication, interface typography has a decidedly functional focus.

Readability in this context refers to the ease at which words or sentences are read. In some sense, this is of limited importance to interfaces that consist mostly of short menus or labels with few succinct words or sentences. However, it can be argued that even when this is the case, most interfaces also present the user with contextual information, like tool-tips, descriptions and the like. Those elements are oftentimes set in the same typeface family and thus this secondary use alone warrants close attention also to short paragraph typesetting. Furthermore, there also is an argument to be made that while distinct interface elements might consist of few succinct words that are not, in the traditional sense, read in sequence, these elements might in their arrangement still form sequences that the eye scans not much unlike reading a sentence. Readability is thus affected by:

- **Generous x-height:** The space between baseline and x-height is crucial for reading words, especially when consisting predominantly of lowercase letters. For the lowercase, most Latin based languages have the majority of glyphs enclosed between x-height and baseline, glyphs with ascenders are less frequent still and glyphs with descenders least frequent. Consequently, a generous x-height maximises the space the majority of word characters can utilize. Independent of the layout, interface elements are commonly separated entities. Given that each element reserves enough space to horizontally accommodate the label or text information it contains, having a generous x-height maximises the use of space within the word shape itself. This in turn increases legibility of single glyphs, as argued in more detail in the following section.

- **Horizontal spacing:** One general maxim in interface design is saving horizontal width. This comes as the result of trying to fit much content or interaction options on the visible section of the screen. Illustration 3 shows this from a comparison of the typefaces **Tahoma** and **Verdana**, which are very much related character and construction, but differ significantly in spacing. In contradiction to this interface design constraint, readability from screens (and in general) is often improved with a somewhat loose spacing, as this reduces crowding within words and even between neighbouring words (*Chung,* 2004). Too tight spacing in small sizes can further lead to pixels of adjunct letters merging together due to anti-aliasing, as shown in illustration 4. However, in a reaction to save horizontal

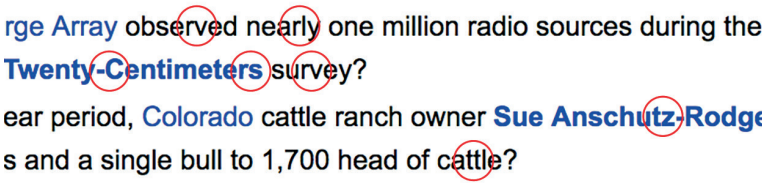

ILLUSTRATION 4: Screenshot of **Wikipedia.org** rendering in Chrome on a Macintosh operating system with the browser default sans serif **Helvetica** at default size. Particularly r and t seem prone to merge with other characters in this particular example.

space, type on screens is often designed or set too tightly. While this is an acceptable response to the design constraint of interface use, it needs to be noted that as such it can hinder readability. The detrimental effects of too tight interface text spacing get further amplified in very small text sizes. This is noteworthy in particular when looking at how universally interface typefaces also find application for screen reading as general workhorse typefaces.

ILLUSTRATION 3: **Tahoma** (top) and **Verdana** (bottom) in direct comparison at different sizes. **Tahoma** is essentially a less wide version of **Verdana**, and what it gains in tighter spacing it loses in legibility at smaller sizes. **Tahoma** was used as the default interface typeface for Microsoft's Windows XP operating system.

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ILLUSTRATION 5: TOP: Too close word spacing visually merges the menu items into one word entity, since the difference between word space and letter space becomes negligent.
MIDDLE: Regular text word spacing still too tight for interfaces, since the words would be read in and as sequence.
BOTTOM: Menu items with additional spacing form separate entities.
Typeface used: **Clear Sans**

ILLUSTRATION 6: Menu items separated by a generous amount of space on theguardian.com (24-11-2016). There is enough space to avoid misreads like «football opinion» as one item.
Typeface: **Guardian Egyptian Web**

- **Word spacing:** Similar to metrics, an overly tight word spacing can negatively impact readability. With button labels or other interface elements consisting of two or three words, a tight word spacing is acceptable since they are perceived as one distinct visual unit within the layout, as explained by Gestalt laws[9] of proximity and closure (see illustrations 5 and 6). The same effect, however, when evident in whole sentences hinders readability and reading speed, since readers will fail to perceive word borders. Equally, too wide word spacing in continuous text will be disruptive and hinder a smooth reading experience just as much.

- **Even weight and texture:** Although not a readability feature in the traditional sense, the reading of interfaces often happens in a jumping manner that quickly scans for information (more on this in *chapter 3.3*). This in turn dictates that glyphs should have even weight within a word, and even tone within text[10]. It is common practice to draw capitals in slightly stronger weight than the lowercase to achieve a visual correction that makes the characters appear as having same stroke width. Overly pronounced capitals like this, as often customary for reading typefaces, are undesirable in interfaces, where this would give distracting emphasis to words set in mixed case. Equally, strong stroke contrast within each glyph, like in traditional antiqua typefaces, will produce a more irregular and lively overall tone. This has the same detrimental effect of arbitrarily drawing attention to words or letter combinations appearing more dark than others, as each word's appearance is more vivid and uneven than with monolinear glyph designs.

2.2.2 Legibility

Contrary to the duality in which factors affecting readability differ between use in interfaces and use in text screen reading, the factors influencing legibility have little negative impact on longer text setting. Legibility is understood here as the aspect of decoding individual glyphs and words with ease and certainty. While this is arguably of high importance to any typeface outside the realm of exuberant display faces, this «explicit legibility» (discussed in more detail in *chapter 3.2*) is of utmost importance in interface application. Firstly, users may encounter unknown words and thus cannot use sentence or word meaning to infer possibly unclear glyphs, as pointed out by *Korolkova* in our email interview (2016). Secondly, interfaces might not offer the user a very comprehensive set of glyphs visible at any one time, so distinguishing possible look-alike glyphs (pairs like 1, l and I[11]) through exclusion from already identified glyphs might not be viable. And thirdly, it has been widely shown that users quickly scan interfaces instead

[9] Gestalt laws of grouping refer to observations by early 20th century Gestalt psychologists and can be used to explain how humans perceive grouping. Common methods of grouping can be summarized by proximity, similarity, continuity, closure, and connectedness, although more detailed categorisations have been proposed.

[10] As customary in type design, «tone» or «weight» here refers to the overall brightness impression of text set in a typeface. It can be imagined as a moderately blurred paragraph of text, and even tone refers to an impression that exhibits little variation in brightness throughout the paragraph.

[11] Throughout the text single characters are often referred to. In order to avoid ambiguity those are highlighted in colour and typeset in the «**Silta**» typeface.

of reading all presented information (*Nielsen,* 1997; *Krug* 2006, PP. 21). What this means in the context of legibility of interfaces is that they profit from typesetting that is quickly legible at a glance and without having to burden the users' cognitive load further by having to decipher unclear glyphs and words.

Consequently, the following attributes can be categorized as influencing legibility in substantial ways:

- **Explicit glyphs:** In this term are included two aspects regarding the identification of single glyphs. On the one hand, this refers to glyphs that in a particular font can be easily confused. Several such groups or even just pairs have been identified in various studies, of which *Beier* (2012, PP. 70) provides an excellent overview. To avoid confusability, special attention needs to be paid to designing glyphs within those groups in question to be explicitly different from each other. It can furthermore be argued that such easily confused glyphs are highly specific to any particular design, because many typeface attributes like serifs, stroke contrast or curve tension affect exactly how similar shapes will be within a distinct typeface design (see illustration 7). On the other hand, «explicit glyphs» refers to how easily recognisable glyphs are in regard to what users expect them to look like (this is further discussed in *chapter 3.1.1*). This is underlined by the detailed inspection of typefaces in *Appendix I*, which mostly adhere to very common letter skeletons — an appropriation of *Stanley Morison's* (1936, P. 6) maxim of designing for the *"most conservative reader"* to the digital domain. This faithfulness to the most common glyph skeletons serves character recognition as much as it tries to avoid drawing attention to the font itself, an aspect generally discouraged for typefaces that are intended to be unobtrusive.

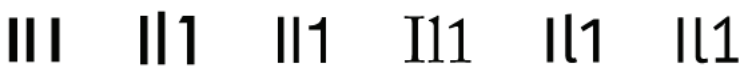

ILLUSTRATION 7: The characters capital I, lowercase l and the number 1 in different fonts arranged in different degrees of explicitness. Typefaces from left to right: **Gill Sans**, **Futura**, **Helvetica Neue**, **Adobe Caslon Pro**, **Fira Sans**, **PT Sans**

- **x–height:** As already noted with readability, the x-height plays a crucial role in identifying a majority of letters of the Latin alphabet. This is particularly exaggerated in small sizes where the internal letter features and counters clog up due to insufficient space available for pronounced detail. This results in x-height being a major factor in readability at small sizes (*Poulton,* 1972). A larger x-height allows for designing more discernible features, and open counters become even more clear[12]. However, according to *Sowersby* (2016) "[t]*here is a*

[12] It is crucial to note that large or generous x-height here refers to the relative height compared to more traditional reading typefaces. As measured in ***Appendix II*** those inspected interface typefaces average at an x-height of 74.0% of the cap height. Traditional reading faces like **Adobe Garamond Pro** (59.7%) or **Adobe Caslon Pro** (60.1%) have considerably less tall x-height.

point where large x-height can start to work against itself, other letter-forms become compromised and legibility can be reduced. It is not simply a matter of saying, 'a larger x-height is better'". In conclusion with *Herrmann* (2012) and *Sowersby* (*ibid*), the positive effect of increased detail within the baseline to x-height bound is outweighed when the x-height becomes so tall that, for example, discriminating ascenders becomes difficult, as demonstrated in below illustration.

Hnh Hnh Hnh Hnh Hnh

ILLUSTRATION 8: Different modifications to the **Silta** typeface's x-height at same cap height. On the left the x-height is very small resulting in compressed look, in the center the actual design, and on the right the exaggerated x-height makes n and h hard to distinguish.

- **Open counters:** This attribute can be seen as a combination of the two aforementioned. The term counter refers to the enclosed inner white space of characters, such as the inside of the c or e letters. Openness (or also called «aperture») and big counters mean that those features are visually ajar, as opposed to inwards facing and closed. There seems to be consensus amongst designers that bigger counters improve legibility, albeit the reasoning varies. *Unger* (2007, P. 120) argues that open counters emphasise the black letter parts and thus further legibility, whereas *Bigelow and Holmes* (2014) refer to the origin of handwritten humanist scripts of the renaissance to argue that *"open counters help maintain letter identity and separation under sub-optimal viewing conditions"*. A study conducted by *Fiset et al.* (2008) finds line endings as one of the most important glyph identification features. From that viewpoint, it is apparent that a wide aperture further emphasises line endings when compared to near closed counters where identifying line endings is harder, as illustration 9 shows. The range of this varying degree of openness is illustrated below.

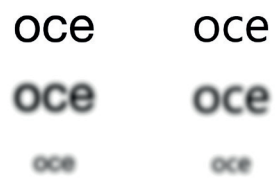

ILLUSTRATION 9: Demonstrating how open counters affect the clarity and ease of distinguishing different round characters. Applying similar amount blur at different sizes to simulate the effect of this feature for readers with impaired vision.
LEFT: **Helvetica Neue**
RIGHT: **Silta**

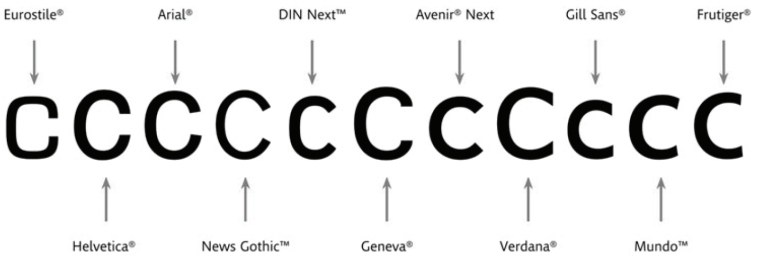

ILLUSTRATION 10: An illustration from ***Reimer et. al. (2014)*** comparing different typefaces' aperture, from (left to right) square grotesques to grotesques and humanists.

2.3 Intersection with other typeface genres

One of the common shortcomings of typeface classification systems is the relative inability of describing edge cases, where a typeface might fulfil characteristics of more than one class. On the one hand, it is often useful to focus a type design on one particular use case during the design phase, and this is advised in several instructional resources. This limitation is contrived to guide design decisions, because there is a clear case to argue and validate against. On the other hand, however, type designers acknowledge or even welcome when their typefaces find application different from their original design intent. In a sense it only speaks to the versatility of a design, if it can be used differently than the original design goal suggests.

In the inspection of the common characteristics of interface typefaces the following categories can be identified as sharing features with interface typefaces. It is worth comparing common denominators for design inspiration as well as reviewing how similar obstacles, such as legibility, get solved under different restraints.

2.3.1 Signage and wayfinding typefaces

In particular the attributes described in the earlier inspection of explicit legibility are prominent in typefaces designed for signage and wayfinding. Like in interfaces, it is of utmost importance that letter shapes are easy to recognized and cannot be confused. In signage typefaces this obstacle is further amplified by the environmental factors of the reading situation: Weather conditions might affect sharpness of contours, daylight and artificial lighting conditions vary vastly, and the reading distance often has a wide range for which the letter shapes need to perform well. The British arts and crafts movement of the early 1900s inspired Edward Johnston and led him to apply a humanist construction model based on his calligraphy to his sans serif typeface design for the London Underground in 1913 (see illustration 11). It is an iconic example from the history of sans serif typefaces applied to wayfinding, and by now road signs around the world (of Latin based scripts) feature predominantly sans serifs of different variation.

Wayfinding also shares similarities to interface typesetting in the restraints that are imposed on available space, as illustration 12 shows. Where interfaces need to be typeset to accommodate a multitude of elements without cluttering the screen, road signs and wayfinding systems often need to maximize the guidance they offer while minimizing the impact of their phys-

ILLUSTRATION 11: The eponymous humanist sans serif drawn for the London Underground by Edward Johnston. Image from: https://commons.wikimedia.org/wiki/File:JohnstonSpecimenEN.svg

ILLUSTRATION 12: German road sign using the **DIN 1451** typeface in condensed («**Engschrift**», first line) and regular width («**Mittelschrift**», second and third line) to accommodate words of different length on a road sign of limited space. Also note the descenders of g, which illustrate the need for vertical space saving. Image source from: https://commons.wikimedia.org/wiki/File:Verkehrsschild-Niederbayern.JPG

ical size. Short ascenders and descenders are one clear result from this in the vertical proportions, and this is equally applicable to many interface typefaces.

2.3.2 Screen reading typefaces

While typefaces designed for reading from screen are not by themselves an established genre, they are common enough to warrant outlining some parallels to interface typefaces. These types of fonts often focus on a particular application, like a specific rendering technology or individual device, and can reasonably attempt close control over how exactly the shapes will render. Their aim is first and foremost good readability, and their focus is often on longer text setting. Some examples are specific to the operation system environment, like the group of designs for Microsoft's ClearType sub-pixel-anti-aliasing rendering technology[13]. Other designs are device specific fonts, for example DaltonMaag's **Bookerly** font designed for the Amazon Kindle reader (see illustration 13). And finally there are «screen reading» typefaces with a more general approach, such as *FontBureau's* (2012) «Reading Edge» series, which focus on small sized on-screen type setting in website context. The common denominator of those typefaces is close attention to their eventual usage already in the design stage, in order to ensure maximum readability. A look at the design features which FontBureau outlines in their series confirms the close similarities to interface typography: *"Exaggerated features, Enlarged apertures, Low contrast, Wider forms, Generous x-heights, Short ascenders and descenders."* (*ibid*) Readability in small pixel sizes obviously coincides with the requirements typography needs to exhibit in many interfaces.

[13] The technology also uses the red, green and blue sub-pixels of modern LCD displays for anti-aliasing. See https://www.microsoft.com/typography/ClearTypeFonts.mspx

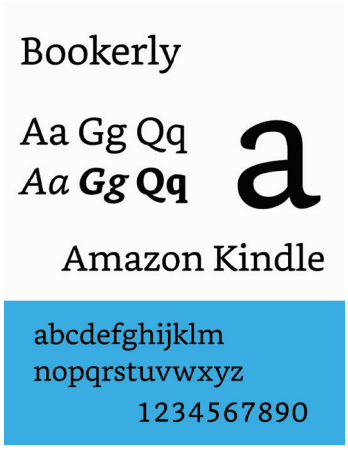

ILLUSTRATION 13: **Bookerly** typeface designed for the Amazon Kindle reader. Image from: https://commons.wikimedia.org/wiki/File:Bookerly_typeface_sample.svg

However, very broad and generalizing claims should probably be scrutinized for their accuracy. Presenting their **Literata** typeface for Google Play Books *TypeTogether* (2015) postulate its *"outstanding reading experience on a whole range of devices and high resolution screens running different rendering technologies"*. While the features of a typeface can indeed be suitable to reading from screens in a highly versatile way – after all, this is the core underlying assumption of this thesis – statements like those contain a good amount of confident product marketing. What is clear, nonetheless, is that such purpose made designs will certainly exhibit attributes that lend itself to good readability, and that there clearly is a market for such typefaces.

2.3.3 Special legibility alphabets

Legibility has many definitions, and often the intention is ideal legibility for a certain reading setting. Optical character recognition typefaces are, by definition, also focused on legibility. However, in this instance it is the computer algorithms detecting letter shapes for which the legibility is designed, while also maintaining readability for human perception. Illustration 14 shows Adrian Frutiger's **OCR-A**, a prominent example of such a typeface. Other such very specialized alphabets are typefaces or typeface variations for children learning to read (see illustration 15) , or fonts designed for readers with dyslexia as well as console typefaces for programming. The common denominator between them is that they cater to a very unique type of legibility requirement that demands unmistakable characters.

This shared focus on functionality is sometimes even increased to extremes, as apparent from illustration 16, which shows an alphabet of car number plates. The character designs of this typeface show paramount attention to explicitly legibility and avoid confusability with quite extreme measures. For example, see the exaggerated hook on J, to differentiate it from I and 1, or the peculiar oval egg shape of the O. But the abbreviation in the name of this typeface hints at even more intricate design considerations taking the particular application on car registration plates into account. FE is short for «Fälschungserschwerende» (impeding forgery), and points at design aspects that prevent the letters of this type to be modified by over-painting black parts. To mention just one example, E can not be transformed into an L simply by over-painting the two upper arms, due to the serif on the L.

In interface typefaces this commitment to legibility is often not this far reaching, but the sample categories reviewed here exemplify how use cases and their demands for functionality can warrant overwriting aesthetic considerations. These examples can serve as an argument to justify using such explicitly legible character designs despite challenging the overall stylistic coherence of a typeface design.

ILLUSTRATION 14: **OCR-A**, by Adrian Frutiger. Image from https://commons.wikimedia.org/wiki/File:OCR-A_SP.svg

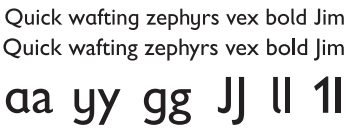

ILLUSTRATION 15: **Gill sans infant** (top) compared to **Gill sans** (second row). Some of the main differences shown pairs in the bottom row, with **Gill sans infant** left, and **Gill sans** right.

ILLUSTRATION 16: Alphabet of the **FE-Schrift** used in Germany's car registration plates, designed by Karlgeorg Hoefer. Image from https://commons.wikimedia.org/wiki/File:FE-Schrift.svg

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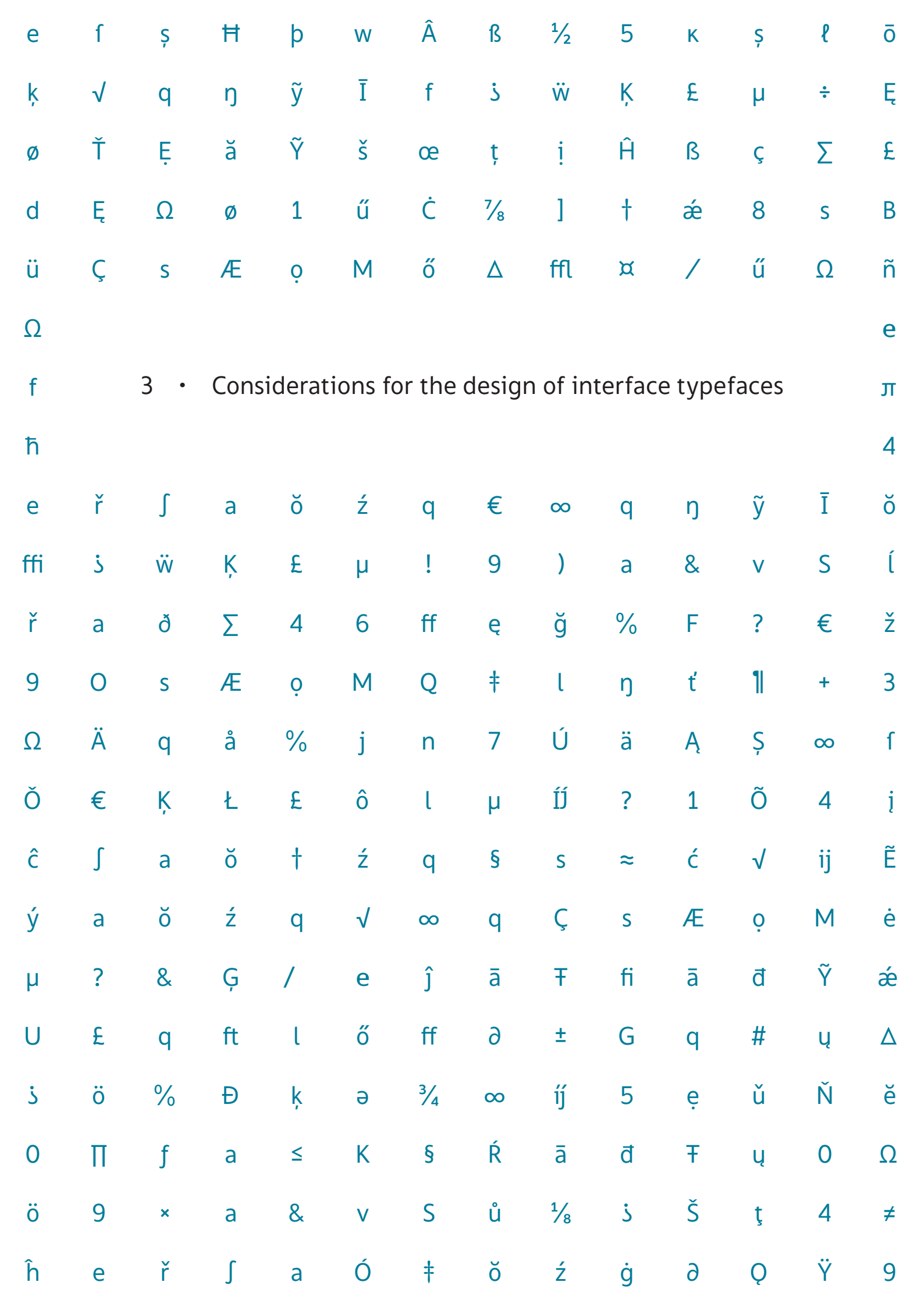

3 Considerations for the design of interface typefaces

As shown in the previous chapter, reviewing and referencing existing samples and related genres can illuminate many of the nuances involved in the design of the interface typefaces. The following chapter provides a more in depth analysis into the validity and the reasoning behind those observations. Furthermore the digital medium and application in screen typography as the main use case of interface typefaces can aid in understanding of the requirements they need to fulfil and thus guide the design process.

3.1 Legibility models

Trying to understand how to design effective type demands for investigating in more detail how the act of reading takes place. Research over the last two centuries has advanced our understanding of the reading process, yet many aspects are still the object of speculation or assumptions without definitive proof. In particular, how the aesthetics and tone of a typeface influences reading behaviour is one of the most elusive topics in this domain.

In this following discussion of legibility models it is imperative to acknowledge that those are not rivalling explanations. Often they focus on different cognitive tasks or can be used in conjunction to explain the more complex overall reading process. Furthermore, there is an implicit understanding of language context in those of the presented models that factor lexical meaning into the recognition of letters and words. The focus of this review is on listing possible avenues from which the designer can approach the concept of legibility. Although this is not essential to their understanding, those theories are listed here in more or less chronological order to their popularization, and often one builds on the insights and limitations perceived from their predecessors.

3.1.1 Template matching

The idea that the letters of the Latin alphabet follow agreed upon conventions has affected considerable influence upon typographers for centuries. The term template matching refers to the assumed cognitive process in which readers compare a mental model, or template, of a letter and compare a visual stimulus they are presented with to that prototype shape. This idea's inspiration from Greek philosophy has resonated well throughout the roughly six hundred years of crafting type. The idea of type of "a true shape" first advocated to type founders by *Joseph Moxon* in 1693 (republished 1962) proves influential to this day. Throughout history many attempts to explain

what such an ideal shape in fact is have taken different approaches. At times this resulted in dogmatic solutions like the geometrically constructed «Romain du Roi» seen in illustration 17. Other times this meant looking back in history, to ancient letter models like the Trajan column inscriptions (see illustration 17) or the earliest known printing types of the 15th and 16th centuries. Such "a true shape" is surely also based on readers' exposure to what is the most prevalent letter shape. In reference to this, typographer *Stanley Morison* states in his «First Principles of Typography» (1936, P. 6):

> *"Type design moves at the pace of the most conservative reader. The good type-designer therefore realizes that, for a new fount to be successful, it has to be so good that only very few recognize its novelty."*

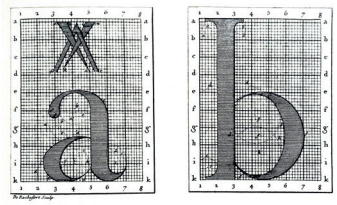

ILLUSTRATION 17: Example gravure that served Philippe Grandjean as model for the creation of the «Romain du Roi» punches. Image from https://commons.wikimedia.org/wiki/File:Romain_du_Roi.jpg

By contrast, *Frutiger's* (2013, PP. 111) observations on common letter skeletons are more pragmatic. While he proposes readers have in their mind a prototypical skeleton of a letter, he arrives at this conclusion not from dogma but by comparing commonly used typefaces users are exposed to (see illustration 18). Letter archetypes, to him, are the self-perpetuating conventions of established shape. Furthermore, he acknowledges that mutation in this shape can stem from the necessities of changing production techniques and technological requirements.

It is further worth noting that the term template matching is often also used in a way that not just refers to identifying a glyph, but also its meaning. Both letter shapes lowercase a and uppercase A indicate the same meaning. For example, mixed case words do not present confusion but are just as clear in terms of meaning as the same word written the conventional way, albeit it is less readable or efficient to read.

ILLUSTRATION 18: Different popular text typefaces' letter a (in small) overlayed on top of each other (large). Image from: Adrian Frutiger: Der Mensch und seine Zeichen. © marixverlag in der Verlagshaus Römerweg GmbH, Wiesbaden 2016.

3.1.2 Feature extraction

While archetype letter shapes can explain letter recognition on an abstract level, cognitive science has advanced in investigating what are the features that readers use to distinguish letters. A lot of legibility research has focused on letter recognition from the perspective of identifying single letters. While this aids designers by distinguishing commonly confused characters, it does not explicitly point out what features make letters confusable. Template matching explains why letters with similar skeleton are more likely to be confused. A study carried out by *Fiset et al.* (2008) went a step further. By showing participants only parts of letters the study investigated what are the areas of letters that are required to identify them (see illustration 19). Justified criticism has been voiced about the absence of white-space as an identifying feature in this method by *Duchesne et al.* (2014). Nevertheless,

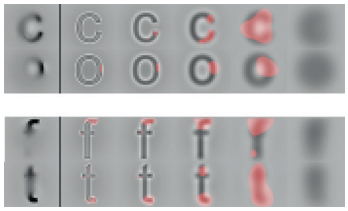

ILLUSTRATION 19: Example of letters and identification zones reproduced from ***Fiset et al.*** **(2008)**. The left column shows a combined classification image of the letters c, o, f and t (top to bottom). Next to each letter are samples at different spatial frequency prior to reducting randomized bubbles (see ***Gosselin and Schyns, 2001***), with portions significant for letter identification highlighted in red.

Fiset et al. have demonstrated stroke endings as one of the important features for identifying single letters. Often this correlates well with a difference in inked area. For example with o and c the (missing) right side of the rounded stroke is the only feature that distinguishes the two characters. The identifying stroke endings of c as the distinguishing factor seem trivial in this case. However, this differentiating feature also has to stand against any other letter where the difference might be less obvious, yet the shape somewhat suggestive of a possible misreading (e.g. e, r or s). However, with letters like f and t one might be inclined to think the central crossing of the strokes to be the determining area, as this is what separated these characters from other letters of the alphabet. In fact the findings indicate that the f is identified most strongly by its ascender, whereas the t has two areas that viewers perceived as strong indication, the terminal above the x-height as well as the rounded baseline tail (noting their test used **Arial**, which has a t with bottom tail) (*ibid*). There are numerous studies on legibility that can profit from the argument *Fiset et al.* have put forward, which seems to emphasize distinguishing features in areas of special importance. For example *Beier and Dyson* (2014) find the addition of x-height serifs to the letter i improves readability. The argumentation for this is that the gap between stem and tittle is emphasized and makes the letter more distinguishable from l or I. Equally, we can argue that the serif on the x-height further distinguishes the character i from l or 1.

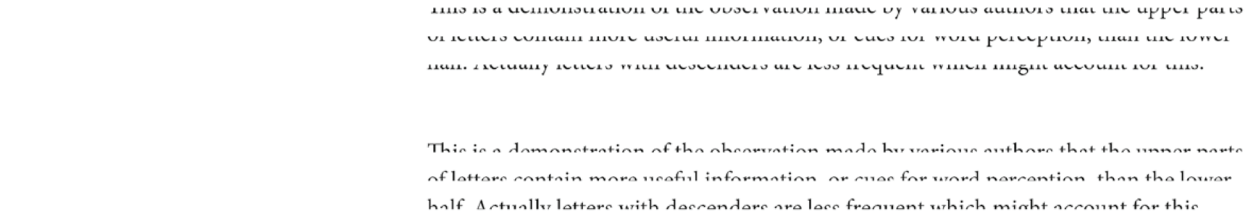

ILLUSTRATION 20: An example from ***Dyson*** **(P. 285, 2013)** illustrating legibility of the same text in two paragraphs. One observation from this experiment is that the top halves of letters appear to be more important for decyphering letters. TOP: The top half of all letters is hidden BOTTOM: The bottom half of all letters is hidden.

Feature extraction thus explains how readers identify single characters, and it has been shown that depending on the character in question, our perception automatically scans for and discerns specific areas of a letter to make a positive identification. Illustration 20 shows this on a more abstract level, when tested against a whole paragraph of text with partially hidden letter areas. While this example is a very generalized demonstration of feature extraction, what can be observed is that different parts of letters (top or bottom half, in this case) carry different amounts of necessary hints that aid legibility. The illustration also provides a bridge to the next aspect of

letter recognition. As pointed out earlier, legibility is not limited to single letters, but in real world scenarios works in the context of words, where the proximity of other letters is equally of consequence.

3.1.3 Word superiority effect and word shape

If the methods of identification of single letters are the lowest, most atomic, level of the reading process, reading words is the consequent next level. It has long been suggested by practitioners and researchers that type forming clear words-wholes is aiding the reading process. The term word superiority refers to the more quick and reliable detection of letters with the help of the shape of a word they are contained in. This has been scientifically suggested as early as 1886 by James McKeen Cattell (in *Rayner et al.*, 2012, P. 61), when in a short exposure test he found words are more easily recognized than single letters. In a recreation of this experiment with more modern methodology, *Reicher* (1969) suggests the explanation that the earliest stages of recognition for both single letters as well as word-wholes run in parallel rather than in sequence. At the time of this discovery the traditionally favoured view was that words can only be recognized after all the letters have first been identified individually.

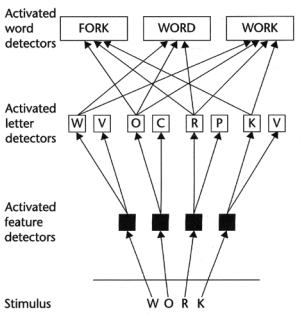

ILLUSTRATION 21: Simplified schematic of a word detection mechanism based on different levels of co-dependent detectors. Image from ***Rayner et al (2012, p.64)***

Subsequent research focused attention not only to letter identification, but to reading of words and text as a whole, which more accurately explains real reading situations. *Bouma* (1973) demonstrated that the letters at word edges are more accurately identified and *Bouwhuis and Bouma* (1979) studied the effect of adjunct letter pairs. Their research suggest that after letter recognition, *"in the decision step, the many alternatives generated in the perceptual stage are matched with a vocabulary of real words"* (P. 12). The recognition of letters is now widely accepted to not happen in isolation from words, but both detection mechanisms influence each other. *McClelland and Johnston* (1977) have shown that the word superiority is in fact inferred from common letter combinations and their shape, not the shape of the entire word. They compared the recognition of words to pseudwords, which consisted of common English language letter combinations but were devoid of lexical meaning. The overall shape of fictitious pseudwords were previously unknown to test participants, yet still resulted in better letter recognition than the same letters arranged into words consisting of uncommon combinations. Their conclusion more accurately defines the importance of word shape. When type designer *Matthew Carter* referred to an understanding that *"type is a beautiful group of letters, not a group of beautiful letters"*[14] it can be seen to touch upon this very understanding of the interplay of letters when set in words. For typeface design this highlights the importance of understanding legibility in the context of letter combinations. Evidently this

[14] Although Carter is referred to for having popularized this statement, it appears to be a proverbial phrase in the type trade.

statement also hints at the importance of spacing and negative shapes between letters, as those are equally contributing to the resulting visual appearance of letter combinations.

The word superiority effect can be seen to have several possible consequences for the design of type, in particular in regard to horizontal spacing. Firstly, word space is important not just for identifying single word-wholes, but without word space (and thus no clear word start and end) also the letters a word constitutes of are harder to recognize and thus have added negative impact on reading performance. *Marchetti and Mewhort* (1986) further find that *"*[t]*he advantage of word context is reduced when words are printed with extra space between the letters"* (P. 23), giving indication that too loose letter spacing can have detrimental effects on legibility (and consequently also a negative effect on readability). With a crowding effect[15] apparent when letters are set too dense, especially at long distance reading, it is important to keep in mind that the opposite extreme has the aforementioned drawbacks and finding a good balance is essential. In regard to interfaces, the effect of missing sentence context is further implied, since words in consequence here do not necessarily form meaning, for example in a menu list.

[15] Crowding is the phenomenon when the surrounding letters around a fixation point of the eye interfere with recognition.

With many of these studies the word shape created by the alteration of full height capitals, lowercase with descenders, ascenders or only x-height features, plays a key role to correctly identifying words and matching them against a dictionary of familiar words. *Haber and Schindler* (1981) examined the error detection rates in stimuli of same word shape. They saw that erroneous words of similar shape (for example «tesf» instead of «test», as opposed to «tesc» instead of «test») were more easily spotted as mistakes in a proof reading task. This seemingly strong indicator that word shape has impact on legibility has been challenged by *Paap et al.* (1984). Their study compares error detection for substitutions that are confusable in letter shape and substitutions with highly confusable letter pairs. Their findings show that the coincidence with single letter confusion is the main contributor to the assumed word shape superiority and thus word shape is of less importance than confusability of those individual letters groups.

3.1.4 Font tuning and font familiarity

Two related issues that have frequently been theorized about by typographers and researchers alike are how exposure (short or extensive) to a typeface and its traits impacts legibility and readability. Literature here distinguishes between the effect of tuning in to a typeface through reading text set in that face for a short time, and familiarity with a typeface from previous and continued reading experience.

Font tuning was proposed by *Sanocki* (1988) as a result of studying the effects of mixed font features (seriffed and sans serif) on letter identification. From a typographers point of view it seems an almost absurd experiment, yet lays the ground research explaining just why it is that the coherence of different letter-features in a typeface are of importance to legibility and readability. By today's standards, Sanocki's test typeface seems somewhat odd and over-exaggerated, which makes the results seem more relevant to the mixing of different fonts rather than different features (see illustration 22).

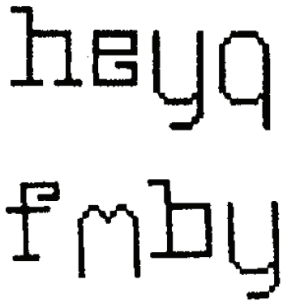

ILLUSTRATION 22: Fonts used by ***Sanocki*** in his **1988** study. Letters e and f exhibit very decorative terminals, whereas m and y show linear traits, all mixed within single words. Glaring incompability of baseline alignment and x-height makes the perceived findings questionable from a designer's perspective.

In more current research on font tuning *Beier and Larson* (2013) found that exposure to typefaces with uncommon features (see illustration 23) does not negatively impact reading performance. In their experiments fonts with conventional and fonts with uncommon features equally profited from a short exposure time. Readers, however, expressed dislike for the fonts with uncommon features. This would speak in favour of font tuning, as readers adapt to a typeface's unique features disregarding of what are conventional letter shapes. The expressed dislike for the samples with uncommon features thus cannot be interpreted as a readability hindrance. However, it is possible to view them as having detrimental effect on usability. In fact, studies have shown how visual appeal can affect usability of interfaces[16]. *Paterson and Tinker's* (1932) research is a hallmark of readability research also in this regard. They found that **Kabel Light**, at the time a geometric sans serif with distinct visual novelty in comparison to the other test typefaces, was equally readable. Nonetheless, test subjects expressed dislike for its aesthetics. *Hochuli* (2008, P. 54) offers the explanation *"that typefaces – regardless of their optical legibility – trigger particular feelings on the part of readers simply through their appearance, and can have a positive or negative impact".* Font tuning thus provides some answers to questions regarding readability, but fails to address the implications of aesthetic deviations within a typeface.

[16] For example see *Larson and Picard* (2005), *Michailidou et al.* (2008) and *Varela et al.* (2013)

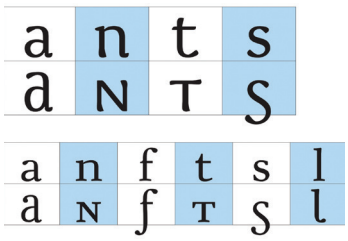

ILLUSTRATION 23: Uncommon letter shapes of a custom typeface design used by *Beier and Larson* in their **2013** study. Typefaces used, TOP TO BOTTOM: **Spencer**, **SpencerNeue**, **Pyke** and **PykeNeue.** Each typeface's "Neue" variant shows the unusual features. Image from *Beier and Larson* (2013).

Font familiarity can also be referred to as the phenomenon explaining what readers expect letters to look like. Typographers like *Stanley Morison* (1936) believed exposure to the commonly used typefaces predisposes readers to the features present in those typefaces. Innovation in typefaces that depart from those established forms would have to be in minute details that the average reader does not notice. This kind of thinking leaves type designers in an obvious dilemma. On the one hand, changes in production techniques, aesthetics and legibility research require type design to evolve. Yet on the other hand, according to theories of font familiarity, any changes that deviate from the established norm challenge readers expectations and have negative impact on readability. From past type designers of distinction, *Beier* (2009, PP. 48) observes as follows:

> *"Gill, Dwiggins and Goudy all left behind a legacy of high craftsmanship and a deep interest in the reader's well-being. Having seemingly no knowledge of the theories put forward in cognitive psychology, these designers recognized familiarity at the same time as they argued for changes to less legible characters towards features of a higher visibility. This suggests that, in their work, they focused on visibility and familiarity simultaneously, and that they also recognized the two processes as being separate aspects of their own designs. They furthermore saw the matter of familiarity as being something they could take an active part in by slowly educating the reader towards typefaces of a more functional nature."*

In her discussion of familiarity *Beier* (*ibid*) acknowledges this divide, but also points out that designers have instinctively tried to reconcile the two with an eye for progressing their craft.

Experiments investigating how readers adapt to uncommon features in a typeface *Beier and Larson* (2013) come to unexpected conclusions when evaluating their own findings to Sanocki's indicative research (above mentioned). Using a more nuanced experimentation material, they find the effect of font tuning to be in contrast with font familiarity: *"The findings did not suggest that the level of previous exposure with a particular typeface was a factor for the reader: new typefaces may not have a negative influence on the reading process"* (*ibid*, P. 30). On the one hand, this gives support to established typographic convention and shows that too far a departure from common norm finds little acceptance with readers. On the other hand, this speaks to the adaptability of the factors governing readability and objectively measured reading speed. Font tuning seems to work as a mechanism that extracts common traits from a typeface and, according to *Sanocki and Dyson* (2012, P. 137), enables more font-specific and effective letter identification:

> *"More important for reading, font-specific details could be a basis for tuning within and across strings. The idea of tuning leads to novel predictions about the positive effects of uniformity on letter processing efficiency."*

So in order to further the positive effects of font tuning the relative similarity of features can help readers to more quickly adapt to the shapes of a particular font, and in turn stimulate identification mechanisms at the letter level.

3.1.5 Neural network models

It is obvious that many of the aforementioned aspects involved with recognizing letters and words inform each other in a natural reading process. Neural networks have been proposed as the theoretical model that can explain several of the limitations of the approaches focusing only on particular aspects of letter recognition. Neural networks are modelled after biological nervous systems with their multitude of nodes and connections. The nodes in such a system are connected and affect each other through affirmative or inhibitive signals, which in turn emphasize or suppress the node's role or message in the network. *McClelland and Rumelhart* (1981; and *Rumelhard and McClelland*, 1982) first published such an *"Interactive Activation Model"*, in which they argue how feature detection, letter recognition and word recognition are not sequential, but parallel and mutually informative processes. For example, an identified initial letter will emphasize words detectors that match words starting with that letter. Or certain detected letters in a word will activate possible word matches, but also feedback to the letter detectors identifying any still unclear letters. One important aspect of such neural network models is that possible detectors are not binary, but as *Rayner et al.* (2012, PP. 61) point out, in fact form an additive probability. Several detectors can be simultaneously activated to a varying degree, with the most likely conclusion from their combined signal as the transmitted outcome. Due to this robustness, such theories can adequately explain more diffuse edge cases. An example of this is recognizing misspelled words while still perceiving their correct meaning, and even not consciously noticing the spelling error.

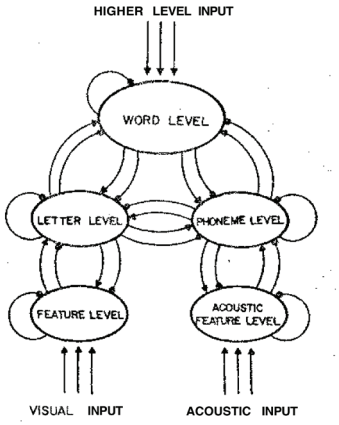

ILLUSTRATION 24: An *"Interactive Activation Model"* from *Rumelhart and McClelland* (1982, P. 89). Note the inclusion of auditory stimuli. Image from *Rumelhart and McClelland* (1982).

Neural networks also offer a good model for explaining adaptation. Much of legibility research with test subjects is done with proficient native speakers. Slowly learning to recognize common letter combinations when learning a new language is one such case where word, sub-word and phoneme level detectors only start to develop and offer guidance as the learner progresses and has enjoyed exposure to a new language's common constructs. Equally, children learning to write will misspell words based on the phonetic sounds of letters. The same mechanism that allows them to make such a guess based solely on the phonemes of a word in turn allows skilled readers to decipher, in reverse, what the misspelled word actually is. Although it is hard to draw concrete conclusions for the design of typefaces from this, it is by far one of the best approaches for reconciling the many, often concurrent and contradictory, factors affecting legibility, word recognition and readability.

3.2 Explicit legibility

With the assumption of explicit legibility as one of the key factors for effective interface typography, and viewing it with the discussed models of reading in mind, some generalized conclusions can inform the design of typefaces. It is worth stating that this prominent focus on legibility is not, in fact, dictating any one particular style of typeface. It rather is a quality that can be ingrained in any kind of typeface design.

3.2.1 Avoiding ambiguity

When striving to make characters especially apparent it is easy to lose the perspective of the entire charset and its interrelations. As discussed in *chapter 3.1.4* on font tuning a congruent internal design of shapes within a typeface is important for legibility, but this does not speak to letter confusion. In fact, it might seem like making different letters of one typeface look like they belong to one group of shapes is counter-intuitive in achieving the task of increased legibility. Special attention needs to be paid to those letters in particular that have been found easily confused through research studies[17]. In addition to providing an exhaustive overview of different letter groups that have been found easily confused, *Beier* (2012, P. 73) provides more generally applicable insight by suggesting groups based on the underlying geometric shapes, as seen in illustration 25.

[17] Although every study inherently also reflects the results specifically for the tested typefaces and reading situation.

ILLUSTRATION 25: Different archetype shapes that are underlying often mistakable letters, as defined by ***Beier*** **(2012, P. 73)**. Geometric shapes such as rectangle, circle and triangle are common to letter groups, yet also introduce confusability. Image from ***Beier*** **(2012)**.

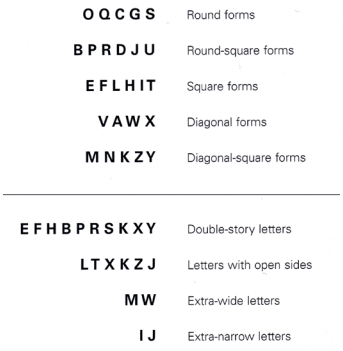

ILLUSTRATION 26 & 27: Letter groups that have similarities in their design approach, as advised in a instructional book on type design (***Cheng,*** **2006, P. 20, P. 74**). Image Copyright © 2006 Karen Cheng. This book was produced and published in 2006 by Laurence King Publishing Ltd., London under the title «Designing Type».

Cheng (2006, P. 20, P. 74) groups letters of similar design approach into groups as shown in illustrations 26 and 27. There is an obvious parallel between design similarities on the one hand, and similar shapes that induce confusability on the other hand. It does not explain all such groups of confusable letters, but certainly helps to draw attention to how significant of a portion the basic geometric construction plays.

To this it could be further added that depending on the design of a font, some letters can be excluded from some groups, or some groups could altogether be conceived differently. For example nmhr could be one such additional group, where the shoulder and combination with stem exit as well as the stem interval are factors introducing confusability, despite their overall shape being of significantly different height and width.

More importantly, all glyphs of a font matter independent of case or script. Mixed case groups like ilIJj (*Eden,* 2013), or non character signs such as θOOooØøϴθ (*Bigelow,* 2013), are equally justified to receive attention[18]. The idea of explicit legibility is, of course, not a novel predicament in type history. The case of the old-style zero illustrates this all too well (see illustration 28). Before the more common use of lining figures the smaller, so-called, old-style figures were designed to blend into a line of text by approximating their vertical dimensions to match the lowercase. This introduced obvious confusability between the lowercase letter o and the figure zero in those antiquas. In these early typefaces, often a contrast-less zero was chosen as shape that would differentiate the two sufficiently, although arguably looking out of place with the rest of the characters that exhibit a heavily modulated stroke contrast.

The case of the contrast-less zero is just one of many that illustrates that the problems of ambiguity are not unknown to type designers. In particular the more widespread design of multi-script typefaces has highlighted many additional confusable glyphs and use cases where context cannot be used as deciding factor. However, as seen from the wide array of studies compared by *Beier* (2012, PP. 70), the regular Latin alphabet itself has plenty of instances where additional attention to avoiding ambiguity will benefit readers. It is worth further examination in how far a common modular approach to type design is responsible for furthering ambiguity by not stressing the distinctive construction characteristics of glyphs more.

[18] For more letter group examples see *Beier* (2009), *Beier and Larson* (2010), *Hex* (2011), *Bohm* (2014), *Beier and Dyson* (2014) *and Beier* (2016)

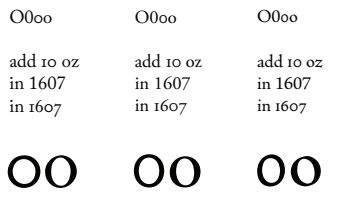

ILLUSTRATION 28: Different old-style typefaces featuring a contrastless zero.
FIRST ROW: Capital O, lining zero, old-style zero, lowercase o. The lining zero was designed in later modernisation of those typefaces.
MIDDLE BLOCK: Examples of old-style zero and lining zero in use.
BOTTOM ROW: Contrastless old-style zero, lowercase o.
TYPEFACES, LEFT TO RIGHT: **Adobe Caslon Pro**, **Adobe Garamond Pro**, **Adobe Jenson Pro**

3.2.2 Considerations for the screen medium

While many of the aforementioned aspects relate to legibility in general, the design of an interface typeface is significantly influenced by considerations for the display medium. Although bitmap fonts are no longer relevant in most modern visual operating systems, the impact of rasterization of a font's bezier curves to a pixel grid are clearly still of importance. Although increasing resolution and pixel density result in ever more accurate rendering fidelity, anti-aliasing of curves in-between pixels is still highly impeding the legibility of screen rendered fonts, particularly in small sizes. Anti-aliasing refers to different techniques of removing aliasing, which in this context describes the negative impact of rasterization. Commonly this anti-aliasing means rendering the pixels of a shape not only as black and white, but smoothing sharp, jagged, edges and curves by adding grey pixels for a more even looking transition. Type designers have used and implement hinting instructions[19] into digital fonts, which can influence how a rasterizer will align and anti-alias the bezier curve information to the pixel grid.

[19] Hinting instructions can be embedded in digital fonts and provide the rendering engine information on how to retain visual conformity. For a simplified example the stems of all letters can be explicitly instructed to render at equal pixel widths, to avoid uneven text colour.

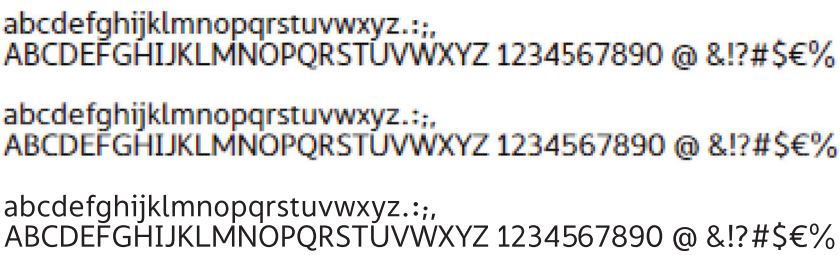

ILLUSTRATION 29: The **Silta** typeface at 9 pixel size. TOP: Screenshot of the OpenType version with manual hints in vertical and horizontal direction at 1600% maginifcation MIDDLE: Screenshot of the OpenType version without any hints at 1600% magnification BOTTOM: Vector outlines scaled to same size for comparison.

Pre-dating anti-aliasing, type designers (for a notable example see Matthew Carter's design of **Verdana**) have gone to the extreme length of designing the desired pixel renditions first, and then crafted the curves and hinting instructions to then match those. This effectively meant designing a bitmap font for each pixel size. The way hinting is implemented in fonts has since improved to be more adaptive and simple (at least for OpenType), and anti-aliasing further gives the type designer more gradual control over how lines in-between pixels get rendered. Although some modern rendering engines completely ignore hinting instructions and utilize their internal algorithms for anti-aliasing and alignment, practitioners still regard it as essential to design thorough hinting (*Lukkarila,* 2016*; Ahrens,* 2016).

On the topic of anti-aliasing *Larson* (2016) demonstrates an important physiological effect in his talk at the 2016 conference[20]. The human perception of spatial frequency is affected by contrast and frequency. Perceiving altera-

[20] Video available at https://www.youtube.com/watch?v=bt3OnDeEVH4

tions of white and black gets less accurate with decreasing contrast. Anti-aliasing renders off-pixel points as grey values of adjunct pixels. The implication of decreasing spatial frequency with low contrast consequently is that off-pixel features rendered as varying grey values can get imperceptible even with the most advanced consumer grade displays available today. Since the design of interface typefaces increasingly is concerned with mobile hand-held devices the potential influence of disadvantageous lighting conditions that further lower display contrast emphasize this problem.

ILLUSTRATION 30: Illustrating the differences between the screen optimised **Proza Libre** (top) and the base design **Proza** (bottom). Note the flattened caps of n, d, l and v that end in a straight angle, the conversion of tapered stems to straight lines in H, d and l, as well as the straight angle of the g bar in the Libre version. Image, with the original highlights retained, courtesy of ***Jasper de Waard*** (2016).

Aside from using hinting technology to influence the outcome of pixel grid based rendering the reverse approach is also commonly used to optimize typefaces for screen display. When the rendering of features like curves and diagonals is expected to result in jagged edges or loss of detail through anti-aliasing, the opposite approach is to alter or design the shapes to accommodate for those expected rendering shortcomings. *Jasper de Waard* (2016) explains just such an approach when adapting a typeface for use as webfont:

> *"*[T]*he outlines themselves would have to be adjusted so that they fit the pixel-grid more easily ... Many of the details in the original, when translated to just a few pixels, end up looking fuzzy, thereby loosing their added value and decreasing the 'crispness' and legibility of the design."*

As illustration 30 shows, the differences between the optimised web version (top) and the original design (bottom) are apparent, yet a valid approach to optimization for screen media. Designing such specific screen versions, however, is quite an extreme approach, unless that is the intended main

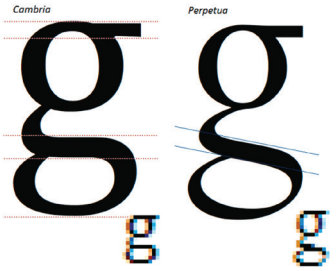

ILLUSTRATION 31: Comparison of ClearType anti-aliasing on a horizontal and a diagonal down stroke of the bowl. Each image shows the vector curves in big, and a magnification of the rendered, anti-aliased letter, in small.
LEFT: **Cambria**, designed by Jelle Bosma, Steve Matteson and Robin Nicholas for Microsoft
RIGHT: **Perpetua**, designed by Eric Gill for the British Monotype Corporation.
Image from ***Larson* (2007)**.

purpose of a font. A good example of this is the design of the ClearType fonts for Window's anti-aliasing technology of the same name. Illustration 31 shows an example of how the letter g in the typeface **Cambria** compares to **Perpetua**. ClearType hinting uses the sub-pixels of an LCD screen for additional detail in the horizontal direction, yet vertical anti-aliasing remains in full pixel steps. The design solution for the downward stroke of the bowl is an ingenious way to leverage the specific advantages of the technology while minimizing the negative impact of remaining limitations.

While such extreme measures might be warranted when a design is apparently suffering from screen rendering conditions, the potentially more viable route is to design for compromise. An more future-proof approach is highlighted by *Tim Ahrens* (2016) in our email interview:

> *"I think these days we can hardly afford to design for a particular technology. We have to be aware that the fonts we design in 2016 will be mostly read on screen, not paper, in their 'lifetime' (which may be infinite, of course). On the other hand, we don't know much of future digital technology, hardware or software, or even reading and writing habits."*

This statement about not knowing future technologies puts into perspective how some fonts, despite objectively not the most suitable for the task, find application in interface typography. If the design aesthetic of the font is excellent, the decisive factor might not be how well designed for a particular purpose the font is.

3.3 Reading interfaces

As discussed in the previous chapter, the physical display technologies used to render interfaces impose their own restrictions and require special attention. To understand how text in interfaces functions, shifting the perspective from the designer of such typefaces to the users that interact with them exposes yet other issues. If the presumed purpose of interfaces lies in successful and efficient human-computer interaction one of the key concepts for analysis is cognitive load, a concept introduced by *Sweller et al.* (1998). To avoid overloading the working memory of users, cognitive affordances should be provided to help the user understand possible actions, system state, and structure the data presented in an interface (*Hartson and Pyla*, 2012, PP. 699). While legibility in itself is an obvious affordance in the sense that text must be visually discernible (*ibid*), the idea of cognitive load can inform interface typeface design in other ways. Having a limited amount of cognitive resources available means text will be set concise. This relates to interface elements as much as the content presented. For

example, *Nielsen's* (1997) findings on how users read websites concludes that *"*[p]*eople rarely read Web pages word by word; instead, they scan the page, picking out individual words and sentences."* Of the four parameters tested by *Nielsen* (*ibid*) (promotional tone of voice, concise text, scannable layout and objective language) both concise text and scannable layout indicate improved usability through shorter and more structured text. This can be explained with the limited *"visual bandwidth" (Hartson and Pyla,* 2012, PP. 788*)* available in screen displays. From both sources we see that with little available screen real estate comes the need to compress information and communicate hierarchy visually. This is further exaggerated with hand-held devices with even smaller screens and less available space.

Willberg and Forssman (2011) provide a good overview of different types of reading as instruction to typographers. Their categories range from "linear" and "informative" to "differentiating", "consulting" and "selective" reading, with the additional "logical" and "activating" types of reading in display uses (PP. 14, terms in the author's translation). According to these functions of reading and their respective typography, interface typesetting can be categorized as a varying combination of several, but corresponds most to the differentiating reading in that it often uses a multitude of typographic measures to structure the presented information. However, with all the different contexts that require interfaces, this type of reading, if it can be called that, is ultimately always a combination of different solutions to clear communication with a focus on structure.

3.3.1 Implications of legibility models for interface typesetting

Based on these observations the constraints on interface typefaces can inform type design for this context. The following points of attention can guide design:

- The typeface should suit setting single words that form word-wholes. This may speak against loose metrics (white space between characters), as this would negatively impact the forming of word-wholes by overemphasising single letter shapes.

- Horizontal and vertical dimensions need to be economical: Horizontal dimensions are condensed through tighter-than-normal metrics as well as narrow glyph designs. Vertical dimensions are condensed by choosing short descenders and ascenders, with ascenders often not even overshooting cap height[21].

[21] See ***Appendix II*** for a systematic comparison of these different metrics in popular interface typefaces, several of which have ascenders on the cap height.

- Small line-height results in short ascenders and especially short descenders. The x-height can be increased to instil as much visual information as possible for discerning glyphs from one another.

bb dd ff gg hh jj kk ll pp qq yy

ILLUSTRATION 32: Showing the differences between **JAF Facit Web** (left of each pair) and **JAF Facit** (right of each pair) for lowercase letters with ascenders and descenders. While the Web version's reduction is barely visible in the ascenders, the descenders have clearly more compressed vertical dimensions.

- The face should provide ample options for structuring texts to allow typographic treatment of hierarchy and different types of content. A wide range of weights as well as optical sizes accommodating extra small or extra large typesetting are beneficial. Optimising for very small size further stresses the importance of hinting.

- Short fragments of text like isolated labels, buttons or menu elements further indicate that the reading process is devoid of the topmost level of meaning extraction, since there is no sentence context to refer to for guessing word meaning. This results in the reading process emphasis on letter extraction and word shape levels of the reading process.

tf npb

ILLUSTRATION 33: Features of the **Ubuntu** typeface as an example of employing font tuning through repetition of idiosyncratic features like the lop-sided bar in t and f, or the spurless shoulders and joins of n, p and b.

In addition to these concrete features we can further speculate about the implications of font tuning in the context of interfaces. *Sanocki and Dyson* (2012) find that if indeed font tuning works in an immediate and highly deductive manner, *"[f]ont-specific details could be a basis for tuning within and across strings. The idea of tuning leads to novel predictions about the positive effects of uniformity on letter processing efficiency"*. When interface typography is in contrast to content typography, for example as entirely different typeface, the change in tone of will benefit from font tuning.

3.3.2 Readability in the context of interfaces

There further is another aspect to reading interfaces that influences the design of glyphs as a result of how users interact with typographic elements. Despite sharing some characteristics with signage typefaces (see *chapter 2.3.1*), interfaces are viewed close up, often within the reach of an arms distance. Compared to reading street signs or other words at large sizes, in close-up reading any one fixation of the eye will have more letters

in the foveal vision[22] at once. This means more letters are perceived in sharp detail in the same fixation. From this, in turn, *Beier* (2009, P. 51) draws the following conclusions regarding letter shapes within a typeface:

> *"If a font has a high internal irregularity, when shown small, the diversity will appear domineering since a great number of irregular elements will be present to the reader all at once. ...* [If] *the same font is shown in larger sizes – meaning fewer letters in the foveal vision – it will present the reader with fewer irregular elements in each fixation, and consequently a higher differentiation level of the font is acceptable to the reader. As a result, extreme internal variation is not necessarily the most suitable for fonts designed for running text in small sizes."*

Consequently, the relatively small viewing distance of digital screen interfaces is one of the aspects that implies avoiding exaggerated letter features. While clear and unmistakable forms are essential for letter recognition, an overly pronounced variation of letter shapes within the typeface is detrimental to readability. This argument is further support for the findings on font tuning presented in *chapter 3.1.4*. In both instances designers must weight overly exaggerated detail in single glyphs against the whole typeface's coherent appearance – also from the perspective of readability.

But not just the physical situation in which reading happens in has changed through the digital media evolution. Text is increasingly consumed from hand-held phones and desktop screens, and this has implications for typography and the distinction between content and interface typography. The default spacing of a typeface tries to best accommodate what the designer imagines the most common reading situation to be. In the case of screen typography this tends to favour loose spacing, compared to traditional print typefaces of similar use. In our email interview *Paltram* (2016) notes that this distinction, motivated by technical aspects of screen displays, is slowly waning:

> *"Historically it was easier to draw a distinction between what is appropriate for a screen and what is appropriate for print, but today it is much harder to draw a distinction between the two, as screens get better and better, and more and more reading happens on screen."*

So while it might be expected that the differences between reading typefaces for print and reading typefaces for screens continue to decline with increasing rendering fidelity, the distinction between use cases and their

[22] The foveal area is the centre of the field of vision, where visual acuity is most accurate. This area is about two degrees from the center of the vision in either dimension *(Rayner et al.,* 2012, PP. 9*)*.

implications become more important. In this then, the metrics of interface typography are tending towards a tighter appearance when compared to the more comfortable letter spacing common for reading long texts.

There also remains a contradiction between the earlier review of the parameters affecting readability and legibility on the one hand, and the constraint of available space on the other. This is not unique to interface typography, but gets even more prominent in this genre. In his review on the dichotomy between typeface legibility and economy *Gaultney* (2001, P. 11) states:

> *"Techniques used to improve legibility, such as the use of wide forms, can actually encourage economy by allowing smaller sizes to be used. Economical techniques, such as condensation of certain forms, can make text easier to read when applied judiciously. The key to harmonizing the two is balance."*

The point he makes can also be transformed into a challenge. This apparent dilemma of saving space is also a chance for innovation and a reason why new typefaces are designed to respond to those limitations with ingenious new solutions.

3.4 Aesthetics of interface typefaces

So far this text has discussed a lot of the implicit requirements interface typography imposes on type design. The following chapter examines the aesthetic choices that affect interface type design as much as any typeface genre. A common advice from type designers is to ask if a new typeface is indeed needed to solve a particular task. Following this, oftentimes novel typeface designs are sparked from new technological developments or use cases to which existing typefaces offer no satisfactory typographic solution. The other major aspect always prompting innovation in graphic arts, however, is the search for new forms of expressions.

3.4.1 Interface typography as branding

While technical considerations are valid innovation drivers that justify initiating new type designs, it is far more common that a new type design is motivated by marketing and branding. Interface typography is not exempt from this. In fact, many of the typefaces commissioned for major operating systems, devices or applications appear to have the communication of a brand image as their primary concern. Although it is evidently important to align those typefaces with interface requirements, that is often subordinate to the goal of distinguishing from competition. And even when an interface

typeface does have explicitly stated attention to stylistic distinctiveness, interface typesetting dictates how far that influence can go. A good example of finding this balance is the **Ubuntu** font for the operating system of same name, a typeface which was created by DaltonMaag. *Paltram* (2016) describes this ambivalence as follows in our email interview:

> *"Generally it was always clear that the font* [Ubuntu system font] *would be designed for the user interface of the operating system, so that was the absolute primary focus, but it had to carry a certain brand message as well. It had to be clear to the reader/user by looking at the typeface that they are in the Ubuntu environment. There was an ambition to be able to distinguish the font from other operating system fonts."*

Distinctness from other operating systems, applications or brands is often the driving force behind the creation of new typefaces. While this reasoning can set off the development process for a new interface typeface, the multitude of possible choices during the design process does by no means result in a lack of expressive range or novel ways of approaching the design. In fact, the restraints of the interface can inform the design from the start on. Illustration 34 shows early design previews by Jarno Lukkarila for a custom typeface for Suunto sports watches and dive computers. As befitting the purpose, the design for numbers and capitals was the focal point in the early stages of the type design. Considering the vital role unmistakable numbers play in the digital screens of diving equipment, the exploration to find the most unequivocal variants of numbers seems more than warranted. In regard to finding the shape language that best resonated with the products' brand, *Lukkarila* (2016) stated that this typeface design underwent a transition from consciously over-exaggerated features towards finding harmonious and non-distracting character designs (see illustration 35). While this was in part motivated by aesthetic factors, also recurring testing on the actual device screens informed the process.

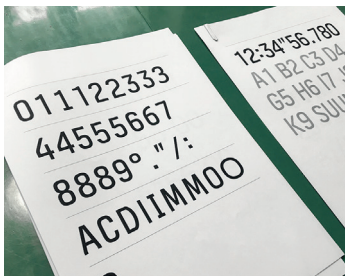

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ILLUSTRATION 34 & 35 (detail): Work in progress print outs of **Suunto UI Sans**, a typeface for Suunto's smart watches, dive computers and branding designed by Jarno Lukkarila. The prints show several character alternatives for evaluation.

In terms of design heritage in interface typefaces, there seems to be a dominant trend of neo-grotesque sans serifs, as expressed by *Sowersby* (2016)*: "Apple kicked it off firstly with* **Helvetica***, then later on moved to* **San Francisco** [the typeface]. *Google are iterating with* **Roboto***, and almost everyone else has settled on one* **Helvetica** *derivative or another"* (typeface name highlights added). However, it can be remarked that these trends do vary, and for example **Lucida Sans** on Macintosh and **Tahoma** on Windows gave expression to a dominating humanist influence in the 1990s and early 2000s. This fluctuation between predominant design styles is less specific to type design than it is applicable to visual design overall. It also shows that the envelope of the term interface typeface can be pushed to allow for a wide range of interpretations in interface styles. The immense popularity

of a particular typeface can also inspire experimentation in new designs. For example the popularity of Mark Simmon's **Proxima Nova** heralded the way for more geometric-inspired typefaces in interface use, although it was not designed explicitly for this usage. Although such geometric designs with overly wide round letters do not lend themselves well to the space saving limitations of interface typography, visual novelty (even if just by application to this particular context) can enjoy much popularity amongst graphic designers. As a result, this naturally affects type designers responding to the emerging market which such a trend opens up.

3.4.2 Elusive neutrality

One equivocal aspect of interface typography is the assumption of neutrality. Obviously, no typeface or design can ever be neutral, and rarely strives to be. As *Bernau* (2005, P. 89) put it in the discussion of his attempt to design a «neutral» typeface:

> *"*[N]*eutrality is just an auxiliary concept to facilitate talking about the expectations of a group of people; the closer you look at the details, the smaller the group will become who see anything labelled 'neutral' as completely meeting their expectations, as neutral."*

When discussing aesthetic choices in interface typography neutrality can be understood from the standpoint of choosing a typeface that does not draw attention away from the actual content. It is perhaps in this relation between interface and content that the idea of neutrality makes the most sense. *Bringhurst* (2004, P. 17) writes that *"*[t]*ypography exists to honor content"* and *"therefore aspires to a kind of statuesque transparency"*. With book typography the aim is for the reader to emerge themselves in the story, in newspapers typography tries to convey information in an authoritative and factual tone of voice, and so on. In the case of interfaces that exist alongside other content, for example on websites, there is two types of textual information present. The text that the interface is made up of, and the content otherwise on the site, and the two clearly have different roles. On inspection of this auxiliary function of interface typography, it is easy to follow the argument that the interface should not distract from the main content and its message. The association is often made that this would be best achieved if the interface typography itself behaves neutral in comparison to the rest of the content. Neutrality thus is often misunderstood as a characteristic that equals not intervening with other content and its typography. Or in other words, it is restrained in expression, or has a generally applicable quality. One possible reason for this line of reasoning is apparent when examining interfaces and what is presented to the user, for example in the case of an

operating system. Quite clearly the choice of interface typography can not in any accurate way reflect the multitude of contexts, tasks and topics that might be presented alongside the interface. The menu of the operating system has to work, no matter if the user is playing games, writing documents, browsing websites, et cetera. As a consequence neutrality can be interpreted as the characteristic of being adaptable to a multitude of use contexts without interfering or communicating connotations from the interface typography that do not reflect the primary task or content.

Interface typography, however, is always not neutral, just like any kind typography can not avoid to colour what it displays. In fact, it is through examining the number of possible contexts that we can see interface typography which is averse to this claim to neutrality. For example the interfaces of computer games (see illustration 36) strongly contribute to the aesthetics of the game world, and their typography often cannot be described as neutral by comparison to our everyday surroundings — quite the opposite. Games use the aesthetics of their interfaces as a possible way to set the tone of a fictional scenario. This leverages the idea of neutrality by redefining it. If the users' assumption is that interfaces are supposedly neutral, and the interface is clearly stylized, then this style is the reset, de-facto «neutral», aesthetic of the game world.

ILLUSTRATION 36: The interface of a computer strategy game set in a futuristic space world (Starcraft 2). The typography of the user interface is part of communicating the game world. Despite the game showing clearly different aesthetics for each of the three civilisations a player can choose to play, the futuristic interface typography set in **Microgramma** remains «neutral».

Instead of the misleading term neutrality it is likely the characteristic of adaptability that can be ascribed to interface typography. Unlike in much other communication where typeface and typography communicate one and the same, interfaces by definition serve as a mediator between user and machine. In this role as facilitator of communication an impartial go-between is more desirable than a strongly coloured tone of voice, which could misleadingly distort the content presented through the interface around it. At the same time, the normative role of typography within visual communication can be used to convey mood and tone in a very subtle manner, and this also extends to typography in interfaces.

3.4.3 Stylistic coherence

In concurrence with researched concepts of font tuning and schema theory presented in earlier chapters it is worth noting that those aspects relating to the stylistic uniformity and coherence often need to be balanced against legibility. While glyphs can become more confusable by overly trying to emulate similarity in shapes, *Sanocki and Dyson* (2012) point out that *"*[t]*he importance of uniformities is supported by a small body of research indicating that consistency of font increases letter identification efficiency"*. So even though some shapes, for example terminal curves of c, a and r, might resemble each other, the resemblance can improve legibility instead of

hinder it. This is intuitive from a designer's point of view, as uniformity in shape language amplifies the distinctive features of a typeface. It is speculative to assess how far readers acknowledge shape deviations, such as different curve tension (see illustration 37), irregular stress contrast or varying stem widths. One possible argument supporting an improved performance of similar features could be Gestalt laws of similarity. When shapes are perceived as inherently belonging to the same category of shapes, less attention is diverted to trying to make this judgement and trying to discern between different groups of shapes that might or might not belong together. This, in return, frees readers' cognitive capacity for processing letters more efficiently as it lowers the visual load imposed on them.

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ILLUSTRATION 37: Illustrating curve tension with different versions of the **Silta** typeface. On the left, curve tension of a, e, o and n are similar. On the right, a and e have been altered to demonstrate a different curve tension from the rest of the round letters, resulting in an irregular appearance.

Inspecting similarity in letter shapes is fruitful not just from the reader's perspective. Type design is often taught and practiced with a very modular approach, in which designing certain characters (prominently H, O, n and o) will let the designer deduct many related shapes. Especially in rationalist sans serif faces many letters can be designed by referencing similar features from other, already designed, letters. For example the design of n defines the basic shapes for m, h, r, as well as the style of transitioning from stem to bowl used in d, b, q and p. This helps the designer in their work flow, but moreover also results in a coherent style within a typeface. Trade conventions old and new lay testimony to this as well. For example in the form of modular stencils type designers use to mock up designs when sketching and pasting together sample words (see illustration 38), or in type design software that caters to reusing parts like serifs or curves of glyphs. In his review of modularity in type design *Mooney* (2010) also points out two other motivations for such an approach. Firstly, he points to stencil typefaces, where the modularity stems in part from the way the typeface will be used[23]. Secondly, he suggests *"ideological factors"* (PP. 11), such as a rationalist approach, where geometry plays an essential role. For example, both in renaissance ideals and their manifestations, such as the «Romain du Roi», as well as modernist alphabets like that of Wim Crouwel, modularity is a form of construction rationale akin to a visual algorithm that creates glyphs following a set of possible instructions. One the one hand, modularity induces regularity and a systematic canon of shapes. Too much emphasis on modularity, however, can result in overly geometric shapes that alienate readers and are hard to read. On the other hand, lack of modularity and the repetition it induces can result in a haphazard or inconsistent appearance of

ILLUSTRATION 38: A stencil used by Adrian Frutiger for drawing the serifs of a typeface design. Image from *Osterer and Stamm* (2014, P. 320).

[23] Stencil typefaces avoid closed bowls and counters. This often results in a separation of common elements that reveal the underlying modular construction.

poor readability. In regard to modularity, reading and type design conventions appear to be in a silent dialogue that gauges just where the limitations of modularity are situated. It is therefore hard, to ascertain if modularity as a means to stylistic coherence is stimulated more by the designers of type or the preferences of readers accustomed to a degree of modularity.

But stylistic coherence can also refer to more subtle overall impression. With type design's near six hundred years of history, rarely is innovation in new type designs detached from previous progress. More commonly new designs follow conventions established over time, and often draw heritage from previous designs of a particular style, period or ideology. When several such influences are mixed to ill effect, it, too, can cause noticeable dissonance within a typeface. Of the types examined in *Appendix II* for example the **Roboto** typeface, especially in its initial design (see illustrations 39 and 40), has received criticism for mixing influences of different stylistic heritage. In his essay, *Coles'* (2011) main criticism of the original design is that *"*[w]*hen an alphabet has such unrelated glyphs it can taste completely different depending on the word."* If words are comprised of letters that exhibit different stylistic influence the effect can be similar, albeit arguably less strong, as when different fonts are mixed (see illustration 41).

Lack of internal stylistic coherency of a typeface is, objectively speaking, first and foremost an aesthetic problem. However, it can be speculated as to how much inconsistent appearance affects the reader's appreciation of the presented information. For example font tuning can explain how a canon of incoherent shapes forms a hindrance to perceiving the typeface as even and slows readability, and Gestalt laws of similarity can be used to argue that overly irregular shapes within a typeface result in observing the different letters as belonging to a different canon of shapes. From a typographer's point of view, however, this internal regularity and unified character in a typeface is of utmost importance. It is precisely because of craft knowledge and experience with what features make a typeface easy to read, that stylistic deviations within a typeface are unacceptable. An established pragmatic meter for this seems simply test reading samples. Any features, letters or characteristics that visually stick out from the texture of the text or halt the reader's eye have to be scrutinized for the reason of their disruptiveness. Type designer *Unger* (2007, PP. 133) lists a poignant example of this craft knowledge when he describes a personal reading experience. He recounts inadvertently dissecting a book's typeface instead of actually reading the text, and only noticed this several pages into the book. Arguably, this is a type designer's developed skill that shows this fine-tuned attention to detail and the phenomenological workings of the reading process.

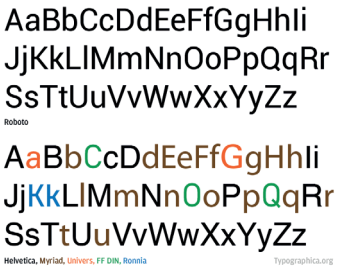

ILLUSTRATION 39: Illustrating the stylistic heritage of different letters in the initially released **Roboto** typeface. TOP: Basic latin alphabet BOTTOM: Different letters and their influence. Image courtsey of Stephen Coles, from http://typographica.org/on-typography/roboto-typeface-is-a-four-headed-frankenstein/

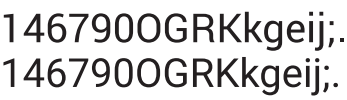

ILLUSTRATION 40: Comparing **Roboto** versions 1 (top) and 2 (bottom). The typeface has undergone continuous development and has been revised in several iterations. Particularly round capitals as well as some idiosyncratic glyphs like R and K now blend in better with the rest of the alphabet.

ILLUSTRATION 41: Example of different word mood in **Roboto** version 1 (top): "'Fudge' is casual and contemporary, 'Marshmallow' is rigid and classical" (*Coles*, 2011). Version 2 (bottom) has more consistent terminals on e and g as well as the adjusted proportions in the capitalis.

3.4.4 Sans serif predominance

In the context of interface typography seriffed typefaces are used only marginally. There is no inherent reason why seriffed faces could not be used in interfaces. However, aside from occasional use of slab serifs, the predominance of sans serifs converges to an established standard. *Berlow* (2016) poignantly remarks on the restraint for conformity evident even within the sans serif archetype:

> *"It has become harder to change the plain regular sans mono-weight 'look and feel' users had been bathing in."*

Firstly, the technical limitations of display fidelity seem favourable of types without the added detail of serifs. Especially at the times when first graphic user interfaces became widespread in home computers the rendering resolution of screens was rather coarse. Serifs require a high resolution to be displayed with enough accuracy and detail at small size. So when first cathode ray tube displays rendered fonts it is clear that the rendering detail of serifs left much to be desired for. In horizontal direction resolution might not be sufficient to render between-pixel values, and letters with adjunct serifs would merge together at the serifs, as shown in below illustration.

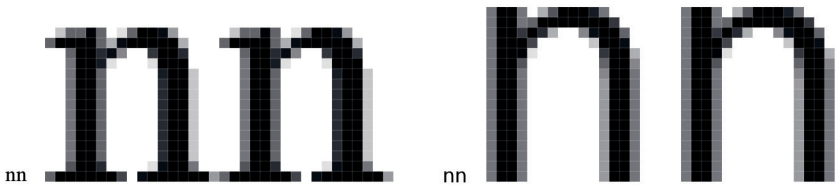

ILLUSTRATION 42: The effects of antialiasing on serifs, both typefaces in 8pt from a retina screen at 100% and 1600% magnification. Note how anti-aliasing at such small pixel size causes the serifs to become exaggeratedly thick and the gap between the serifs of the two n's merge. LEFT: **Times New Roman** RIGHT: **Segoe UI**

In vertical direction, rendering resolution was inadequate for fine details between different types of serifs and curvatures, and in effect often look like a blunt miniature slab serif. *Poole* (2008) makes the interesting observation that while sans serifs are not proven to impact actual reading performance in comparison to seriffed types, professionals such as web designers deemed the rendering of serifs aesthetically inadequate in the past. It further begs pointing out that in an extensive review of studies on the reading qualities of sans serif in comparison to serif faces, *Lund* (1999) has not found any conclusive evidence suggesting either one would be more readable. As such, typographers have impact on shaping the accepted norm through proliferation, and in turn shape user expectations. When designers deemed the crude rendering fidelity of serifs inadequate and thus preferred

using sans serifs for an extensive period, this continuous exposure can be deemed to have had a formative effect in establishing sans serif as the de-facto standard for on–screen typesetting.

Secondly, the sans serif types lend themselves much more to a technology-centric aesthetic common to computer interfaces. Seriffed types are associated with book and text reading, and readers are most familiar with seriffed types from traditional paper-based media like books, newspapers or magazines. Sans serif, by contrast, is often associated with progressive rationalism and modern inventions. Although first grotesques were initially newspaper types, albeit for advertisements (or «Akzidenzen»), sans serifs as a genre came to stand for rationalism well before the digital era. Geometric types of the Bauhaus school are understood as a modern typographic advance in their own term, and tried to revolutionize typography by getting rid of all ornamental features and archaic conventions. Decades later, Swiss modernism, and its various revivals since, equally embodies a rational typographic approach with focus on only the bare essential. In sum, this prevalent view of many variants of sans serifs suggests the interpretation that the same rationalism and modernism we ascribe to computers is reflected in their interface typography by choice of sans serif types.

While this same sentiment of rationalism does not necessarily hold true for humanist sans serifs, they have another argument in their favour that distinguishes them for use in interfaces. As argued in earlier chapters, the open shapes and good legibility qualities of many humanist letter forms are apparent in many wayfinding typefaces. Following the argument of *chapter 2.3.1*, many similar qualities are required for interface typography, and have indeed been adapted for this use. The proliferation of humanist sans serifs was arguably accelerated when some of the most prominent early representatives of outline typefaces in operating systems were of humanist forms, thus further shaping user and designer expectations towards interface typefaces alike.

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4 The Silta typeface family

In this last chapter the creation process of the **Silta** typeface family is inspected in view of the previously discussed aspects of interface typefaces. The typeface is submitted as the main production aspect of this master's thesis and consists of seven weights, both in roman and italic construction. The charset of the fonts largely covers Latin based languages and constitutes 560 glyphs per font. OpenType features, manually set PostScript hinting as well as automatically generated TrueType hinted versions have been created.

4.1 Motivation

My motivation for the design and indeed this research stems form a type user's point of view. As interface designer I have on numerous occasions been faced with the decisions influencing the choice of typeface for an interface. Instead of picking typefaces merely on aesthetic grounds I wanted to understand interface typography inside out, so to speak. On the outset of the project, and with a relatively new-found interest in type design, I was under the naive impression that most typefaces used in interfaces are simply picked, because their attributes are suitable to the task at hand. While this is not untrue, this fails to appreciate that many typefaces are, in fact, designed for this very purpose. With some assumptions about clear legibility the first task of the design work was to inspect some of the most recent typeface designs created for this purpose. The aim was, firstly, to find out if there is any intrinsic features exclusive to interface typography, and secondly, how these contrasted to other typefaces traits. For example one commonly encountered aspect found in many designated interface typefaces was a seriffed I. Digging deeper into the purpose of this particular distinctive feature helped explain the motivation behind it and train my perception to other such features that are often observable in interface typefaces. Other aspects, such as a usually more generous x-height, are neither that easily observed without direct comparison to other typefaces, nor did it make sense or seem as imperative as it does now after a lot more experience with the matter.

Also regarding stylistic matters the design project started with a thorough study of existing typefaces and their use. In particular the unresolved disparity between neo-grotesque and humanist points of origin captured my interest. Yet also genres not commonly found in interface typography were implicitly informative. Despite a strong current revival of geometric typefaces, that style does not seem equally represented in conventional interface typography, and I was curious to find out in more depth why this is. Only in less rigorous applications that have a less utilitarian and sys-

tematic approach than, for example, an operating system, the geometric influences are encountered. Additionally, their very wide proportions often are a poor fit for the constraints of interface typesetting.

A more detailed look at the differences between neo-grotesques and humanist typefaces eventually influenced my own design. Ultimately, the legibility qualities of humanist designs made them more favourable. Neo-grotesques found their way into interface typesetting by way of their compact visual appearance and perceived neutrality – in part because of their over-use. **Helvetica**, maybe one of the most popular representatives of the genre, is a good example. For the design studio *Experimental Jetset* (2003) it often is a default choice that *"refers mostly to graphic design itself"*, and *"*[t]*he neutrality of Helvetica, real or imagined, enables* […] *the user to fully focus on the design as a whole, neutralizing the typographic layer as a way to keep the concept as clear and pure as possible."* It is possible that users' expectations of how a machine interface should behave and feel like to interact with is met exactly because of these seemingly nondescript characteristics of many neo-grotesques. Machines are inanimate and neutral, and so their interface and its typography echo this rationality and appearance of generic design.

Humanist inspired designs, however, seem to be equally prevalent in interface typefaces. The above argument can be applied in reversed form to defend their use just as well. Precisely because computers, and the interfaces through which users communicate with them, are intangible and hard to approach and comprehend, an aesthetic rooted in the humanistic handwritten script helps to bridge this familiarity gap. Just like the tone of copy-writing in interface elements can vary, so can their typographic tone. Proponents of humanist forms like *Bigelow and Holmes* (2014) also argue on behalf of its superior legibility. Their line of reasoning is as follows: When humanist scribes produced these letter forms with cruder tools and with greater irregularity, and they were read under varying circumstances of lighting and writing materials, and by scholars with often poor (read: uncorrected by glasses) eyesight, it all speaks to the versatile legibility qualities of the humanist script. Applied to digital screens, poor and inconsistent rendering is naturally less likely to distort letter shapes beyond legibility. Nonetheless, the traits resulting in good legibility work independent of reproduction medium. This focus on increased legibility is what inspired the **Silta** typeface design.

4.2 Approaching a design based on redundancy and information density

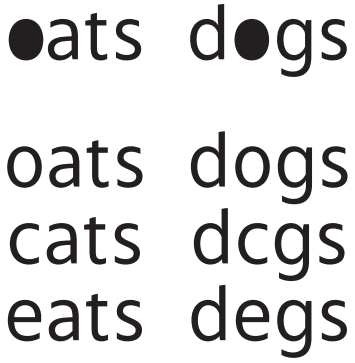


ILLUSTRATION 43: Demonstrating ambiguity and language context. Typeface: **Silta.**

As we have seen in chapters two and three there is a multitude of aspects to legibility and readability that come into play in the design of an interface typeface. So far the aspect of redundancy has only been touched upon indirectly in the discussion of applying neural network theory (see *chapter 3.1.5*) to explain the different levels on which detectors work and influence each other when text is processed. This interplay of shape, letter and word detectors works together in an elaborate and fluid rating mechanism that determines how readers perceive written words (and non-words, for that matter). This same scenario can be examined for redundancy – or in other words – for how information is repeated and encoded within a string. As an example illustration 43 shows the two strings «dogs» and «cats». For sake of this argument the assumption is made that the o in dogs and the c in cats can only be identified as a round lowercase character, so either of o, c or e. Through lexical exclusion (and assuming English language context) the string «d◌gs» can only be guessed as dogs, since «dcgs» and «degs» are non-words. «◌ats», on the other hand, is more problematic. «eats», «oats» and «cats» all are possible words. By inspecting the information content of each letter, the round character amiss in both words contains different amounts of implicit information based on their context. «d◌gs» is definitive and there is only one possible interpretation of the round shape. But in «◌ats» the round shape contains only one third of the information density, because the round shape could be either of the possible three options. When the shape of a glyph is ambiguous (in this example, assuming some condition which renders the round lowercase character difficult to decipher) it contains less information in itself. While word context can mitigate the resulting impediment, explicit glyphs that avoid ambiguity altogether in effect contain more dense information. Redundancy on the level of single glyphs is often coinciding with features that render a glyph explicit. For example the tail on an l can be seen as a redundant encoding of the information that identifies the character, yet in comparison to a capital I the tail can be a distinguishing factor between the two characters.

In "The language instinct" *Pinker* (1994, P. 181) argues that *"[i]n the comprehension of speech, the redundancy conferred by phonological rules can compensate for some of the ambiguity in the sound wave"*. The analogy to written language is glaringly obvious. Ambiguity here can be induced from the reproduction on paper or screen, environmental circumstances or physiological inhibitions and, lastly and most importantly, by a poor type design that amplifies any deterioration from aforementioned factors. For the **Silta** typeface family the multi-layered information decoding model first suggested by *McClelland and Rumelhart* (1981; and *Rumelhard and McClelland*, 1982) have influenced the design process by trying to better understand of how users will read in

the context interfaces. It is, however, misleading to assume that redundant encoding in glyph shapes can be utilised to achieve a more robust design. In fact, from the reader's perspective, *McClelland and Rumelhart's* (1981; and *Rumelhard and McClelland*, 1982) model can rather be understood as a coping mechanism for indiscernible input. The consequence for the design is to shape the typeface with a minimum of ambiguous characters.

The practical implications arrived at in the design of the **Silta** typeface were most of all a need to balance all of those considerations. At an early stage these ideas about making similar letters highly differentiable often collided with established typographic conventions. For example the lowercase bowled letters with a stem, q and p as well as d and b, were designed to differ from other characters with shoulders like r, n and m in the way their bowl departed the stem, as shown in illustration 44. In discussion with my advisors Teo Tuominen and Saku Heinänen this was identified as ultimately deviating too far from the otherwise humanist construction of the typeface's letters. The shoulder of n had a natural upstroke movement in line with handwriting, whereas the forcedly contrasting bowl shape of d, b, q, p and g seemed unnatural and imposed. Examples like this show that a constructed readability following theoretical ideas about letter distinction are often-times well intended, but ultimately fail to form a cohesive typeface that respects centuries of established writing, reading and printing heritage. After all, research on the coherence of shapes within a typeface as suggested by *Sanocki and Dyson* (2012) could be further extended not just to explain user preferences, but also applied to critically examining type design practices. One of the questions every type design has to explore again and again is where to draw the borders between science, craft and art.

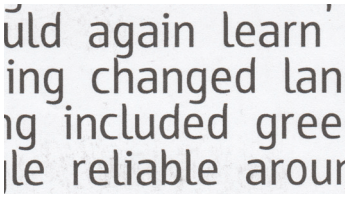


ILLUSTRATION 44: A very early digital version of the **Silta** typeface. Curve exists from the stems of n, u or h significantly vary from those in the bowls of d or g.

4.3 Process

The following creation steps of the typeface family retrace a more or less progressive development from a rough idea towards a more refined and expanded set of fonts. In retrospect some of the conceptual approaches manifested themselves into the samples of the different work stages reproduced here. At the same time, the process also is a documentation of developing the necessary skills related to the conception and creation of a typeface. While in the beginning of the project my experience with designing type and awareness of type history was still very limited, the empirical learning process via exploration in sketches and digital variants of the design is documented here. This chapter is roughly divided into sections mirroring the overall progress of the project, starting from concept and

ILLUSTRATION 45: Very early pencil sketches. Already visible are ideas of using serifs on some characters for increased differentiation. At this point the sketches expressed a semi serif typeface design.

initial designs towards creating and refining a basic digital font, and finally expanding the initial regular weight and style font into several weights and creating a matching italic.

4.3.1 Initial concept stage

[24] One particular tool used for this is the website typecooker.com, which generates a set of parameters that can be used as a starting point of a type design sketch. But also trying to reappropriate existing typefaces via a new sketch roughly based on it is something I practise to generate new ideas.

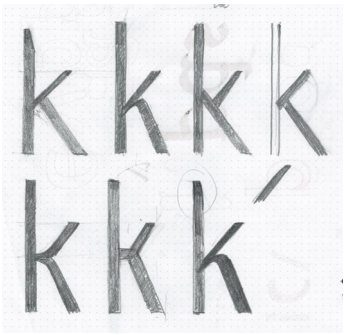


ILLUSTRATION 46: Detailed initial sketches exploring different stem and arm to leg joins in k. The tapering on the z approaches the thinning of the diagonal at the joints in a different way from the final design, but to similar effect.

The initial sketches for the font were the offspring of regular exercises in sketching and constructing different typeface styles[24]. The idea of a sans serif with attention to legibility was something vaguely in the back of my mind, although not the expressed purpose of those sketches. In part, my curiosity towards designing a sans serif variant was the result of my previous and first type design, which is a modern seriffed typeface. At the same time the subtleties of different subcategories of sans serifs were not entirely clear to me in practice, so a more hands-on approach to exploring those seemed potentially rewarding. As evident form the sketches shown in illustrations 45 and 46, the ideas that eventually came to influence this typeface originated from experimenting with a gradual removal of serifs and reducing stroke contrast towards a more mono-linear feel. Those initial sketches still show quite a range of different styles even within a single page, which can be seen as a result of this exploratory activity.

Illustrations 48 to 50 show a second, more developed, stage in sketching for this design. In those sketches the design's idea is slowly taking shape, and it is at this point that deciding on the possible use in interfaces helped direct the stylistic choices. Already at this stage are some of the features that eventually can be found in the final design are apparent. A pitfall evident from those initial ideas is the aforementioned overly theoretical approach to legibility as the sole governing principle. With many of the features present in those sketches the idea was to differentiate letter features from one another, such as the shape of round bowls and shoulders as well as stem endings and terminals. While n and h are indeed more distinct from each other with a different shoulder, it is quite apparent in retrospect how this would negatively impact the readability of the typeface. Adhering to the advise of designing and testing the letter shapes in words is not quite enough to highlight how such a feature variance will negatively impact readability in text setting, where this deviation from regular shape will become amplified by repetition. When commonly similar shaped parts of letters like the shoulders of n and h differ in shape, a restlessness is observable from the text image. This is not to say that the design was disrespecting the common appreciation for regularity in shapes, but instead shows how this theoretical approach over-emphasised the idea of differentiating shapes to the extreme. In retrospect, these missteps are to some degree natural part of the design process. As become apparent in a discussion with type designer *Jarno Lukkarila* (2016), there often seems to be two opposing direc-

tions to uncover the essence of a design. Either the starting point is of a too timid nature, restrained in expression and features, and somewhat too bland for the purpose. This then results in having to amplify some of the features, adding more character and distinctiveness step by step. On the opposite extreme is initially trying shapes and ideas that eventually turn out to be too extreme or expressive for the intended purpose. For this then the aspects of the design that stand out too much get toned down. In this particular design, clearly the latter variant is an appropriate description of the process. In both cases, however, there usually is something in the initial nature of the design that is retained or at the very leasts prompts a reaction that still influences the final outcome. In this sense, even though the initial attempts at focusing on legibility and differentiation of letters within the font were partially too uncommon or negatively impacting the overall aesthetic coherence, they still inspired the design's core focus and how to approach it from different directions.

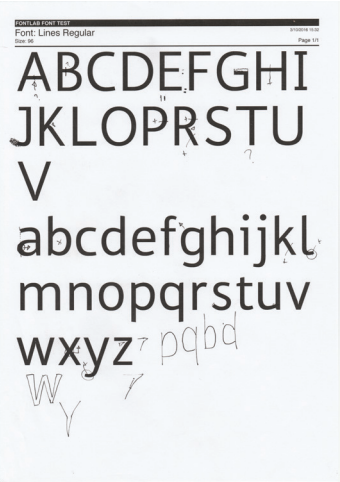


ILLUSTRATION 47: First uppercase designs with annotations by thesis advisor Saku Heinänen. Discussed in particular was different types of tapered diagonal stem joins as well as the stroke logic in bowled characters joining a stem.

4.3.2 Shaping the core design

It may be in part due to this learning experience that the first digitized letters were still quite far from the eventual final design. In my work flow I used paper sketches as the departure point for drawing digital letter shapes in FontLab, and later in Glyphs, but did so in a very free-form manner. While some designers scan in and trace sketches, my preferred way of working is to have the paper sketch next to the computer screen while drawing up the digital version. This visual approximation to the sketch allows for some leeway to combine different sketches with slight variations in such factors as x-height, stroke width and modulation, without having to slavishly follow the scanned in sketch. This way, the sketch also works as a way of designing the flow of the shape in quick iterations, and the digital work then is more

ILLUSTRATION 48: More matured shapes bearing closer resemblance to the finished typeface. Spurs on n and p, i with top serif and explicit l with round terminal are all features retained from this early series of sketches.

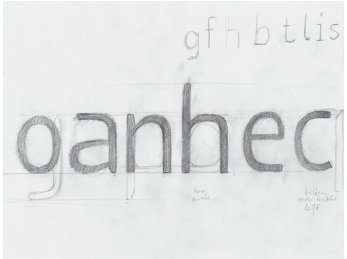


ILLUSTRATION 49: This sketch shows early stages exploring the idea of altering curve tension on different characters with round shapes. Note for example how n and h have a markedly different shoulder, with the intention of making them more distinguishable.

ILLUSTRATION 50: t, l and f further exploring the later abandonded idea of different shape and curvature round terminals.

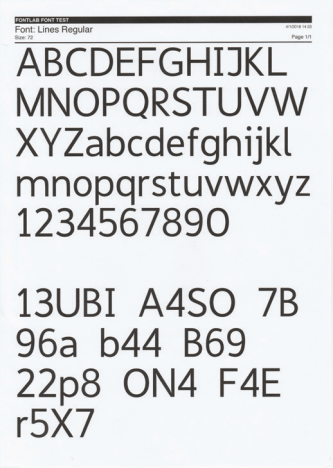


ILLUSTRATION 51: First stage with basic latin characters and a completed figure set. The font already has its overall tone, clear sans serif properties, and remaining serifs are limited to I, i and j.

ILLUSTRATION 52: Testing different text sizes in paragraph previews. The essential shapes of the alphabet still underwent a lot of back and forth at this stage.

focused on drawing the vector shapes. It is for example in this aspect of drawing precise and balanced shapes that improved a lot over the time of working on the typeface family.

In parallel to the design work I also started to gather more information on legibility and interface typefaces. While no particular typeface served as concrete design model, there are some aspects found in the specimens reviewed (see *Appendix II*) that were inspirational. One of the initial ideas for this typeface were hard to confuse letter shapes. **PT Sans** in particular made an impression on me in its treatment of the bowled characters like d, b, q and p (see illustration 53). The bowls of the pair of d and b each exit the stem at different angles at the x-height and re-enter the stem at different angles at the baseline. Flipping the letters by 180 degrees reveals how closely d and p as well as b and q are related to each other. While this difference in the bowl shape was obvious immediately, the underlying stroke logic was not equally apparent right away. Another aspect of **PT Sans**, and several other typefaces, that inspired me was the thinning of stroke joints. For example in n the shoulder exit from the stem is significantly thinner, and the spur of the stem at the top is tapered to further add white space to the corner. The inner corners of letters like v, z or x show similar features. While technically these could be considered ink traps, the same idea applies to digital rendering. Instead of ink spreading the anti-aliasing interpolates each rendered pixel based on its adjunct, actual, shapes. As a consequence, geometrically straight joins clog up and appear darker than intended. Illustration 54 shows several such letters where such features are compared between **PT Sans** and **Silta**. Despite using smoothed thinning instead of angular cuts, and overall having this feature less strongly expressed, the reference is visible.

ILLUSTRATION 53: An inspection of **PT Sans'** bowled characters.
TOP: d b q p
BOTTOM: The same characters overlayed with 180° rotated p q d b in colour shows small glimpses of black where the shapes do not match entirely.

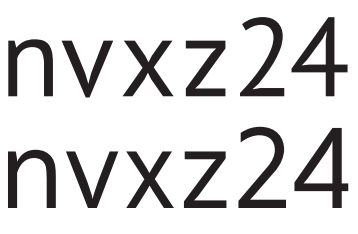


ILLUSTRATION 54: Letters that have tapered joins where lines meet.
TOP: **PT Sans**
BOTTOM: **Silta**

The broad and open appearance of humanist inspired typefaces like **Lucida Sans** or **Verdana** were influential on the design, too. A common shared feature with many other interface typefaces are vertical stroke terminations, as shown in illustration 56. Testing versions with perpendicular terminations and comparing them to a version with straight vertical cuts as seen in illustration 57 showed that visually the characters render more precise in the latter. In particular the combinations of glyphs where a terminal would be adjunct to a vertical stem, like for example in cl, the space in-between appeared more regular at different pixel sizes. However, these vertical terminations are not the outcome of language specific considerations. For example Paul Renner's iconic **Futura** features a mix of terminations at different angle, containing an e in perpendicular, and a c in straight fashion. It was arguably the outcome of the designer's consideration for the intended market of the typeface in Germany, in which the ch and ck combinations are very common and thus warrant special consideration, that supported this decision. In the case of interface typefaces this straight cut, however, stems from working with the output medium of the screen in mind, and how rasterization into a grid affects the bezier shapes defined in digital fonts. Cuts at an angle that are in line with the pixel grid will result in more crisp line endings.

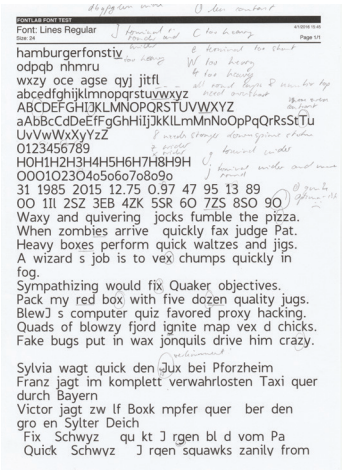


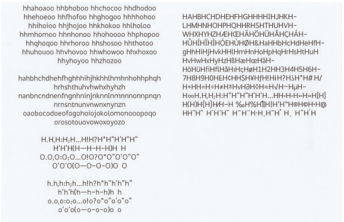
ILLUSTRATION 55: Testing appearance in short sentence or word context.

cseto
cseto
cseto

scarfs scarfs
cafes cafes
eager eager

ILLUSTRATION 56: Different interface typefaces with straight vertical stroke terminations.
TOP: **Lucida Grande**
MIDDLE: **Segoe UI**
BOTTOM: **Silta**

ILLUSTRATION 57: Comparison showing the final version of **Silta** with vertical stroke terminations (left) and a previous working version with perpendicular or angled stroke terminations (right).



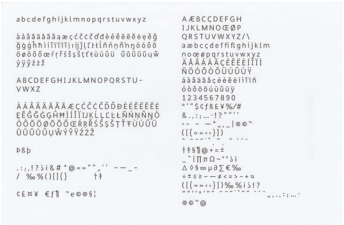


ILLUSTRATION 58 & 59: TOP: Some of the continuous testing and adjusting for letter spacing. BOTTOM: Expanding the charset for include more lating based languages and providing a basic set of punctuation, mathematical symbols and currency characters.

In regard to the core design, the vertical spacing proved to be one of the more indirect factors influenced by the goal of shaping a typeface suitable for use in interfaces. Aside from much on-screen testing at various sizes, printouts like that shown in illustration 58 and 59 helped to continuously evaluate the coherent and even spacing. The method for spacing roughly follows *Tracy's* (1986, PP. 70) suggestions, starting with an even appearance for the letters and combinations of H and O for the uppercase, and n and o for the lowercase. From those, many related side-bearings can be deducted, and indeed in the Glyphs editor software those can directly referenced via

variables. In this regard the software enabled very flexible and quick iterating, by simply changing some reference side-bearings, which consequently changed much of the appearance of the entire typeface's spacing. In a similar manner, extending the charset to support a wide range of Latin based languages was done at this point. Here, too, many composite glyphs, like accented characters, would update interactively when changing one of the components, and allowed for very flexible experimentation. Although including some distinctly designed characters like æ, ß or þ the wider charset still retained quite some flexibility as the majority of characters added in addition to a basic English are composite characters. As a reference for language support type foundry Underware's «latin plus» charset[25] was used, with some minor adaptations. According to this database the **Silta** typeface supports roughly over 200 languages.

[25] See http://www.underware.nl/latin_plus/info/ for more information.

4.3.3 Expanding and refining the typeface family

The initial plan for this project was to create at least a regular weight, but ideas for expanding the design quickly arose over the time of working on it. In part this motivation to create a more comprehensive set of fonts originated from the goal of creating an actual released typeface. On the one hand, the design would find verification through actual use. On the other hand, this also acknowledged that a single weight and style of the typeface would be of limited use for the intended purpose of setting interfaces of complex design and hierarchy. The other part driving the expansion of the family was simple curiosity to learn the necessary skills, artistically and technically. At this point in the production of the typeface I had already switched from FontLab to Glyphs, and after overcoming the initial pitfalls it quickly provided a very intuitive way of working with three master weights. From these, the remaining intermediary weights are automatically interpolated. Initially, the regular weight with a full charset was only partially rendered in the thin and black weights to basic lowercase and uppercase alphabet, partially shown in illustrations 60 and 61. From there on finding the balance between the weights and reaching a satisfactory distribution of weights was a trial and error process. In particular the black weight was a design challenge, because of the extreme span between the regular and the heavy weight. After an initial test, my advisor Teo Tuominen also inspired rethinking the weights from their use case in user interface design, and on his impulse I increased the heaviest weight significantly (see illustration 62), and also gave the bold a decidedly darker tone.

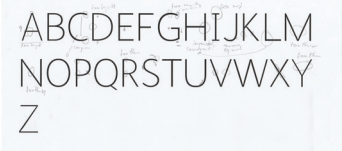


ILLUSTRATION 60 & 61: Initial extremes for the thin and black masters. Starting with the caps was easier to establish the correct extreme without having to initially worry about how the even denser black lowercase would be made to work with the little available space.

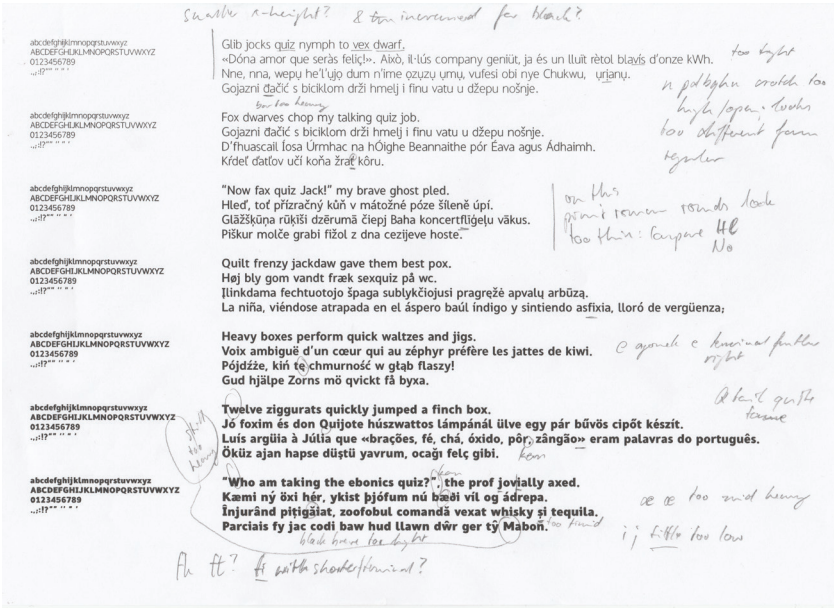


ILLUSTRATION 62: An range of weights interpolated from three masters, thin at the top, regular as thrid from top, and black at the bottom.

After testing and reiterating the weight distribution several times the charset of the two extremes was expanded to cover the same range of glyphs as the regular already encompassed.

Adding the italic was initially something I considered out of scope in terms of effort, but decided to at least start designing – if not as part of the thesis project, then for an eventual release later on. In contrast to the weights, the italic also took a conceptually slightly different approach. The inspiration here comes from considering how an italic might be used in interfaces. Hardly ever are actual interface elements like buttons or menus set in italics, because this would seem to attract attention or cause semantic confusion. The italics for **Silta** are intended to be used in accompanying texts and highlighting terms, or actionable items within a text. Or more generally, for typesetting some portion of text in slightly different voice. Where a regular cut could express the factual information of an item, the italic is intended to be used for a warmer, contrasting, tone.

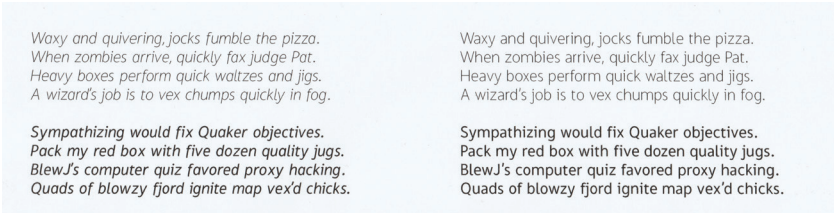


ILLUSTRATION 63: The thin and regular masters of roman and italic side by side in a work in progress print out to check that the tone matches.

The concept I settled on then was an italic that would be, in fact, much more lively and casual, and act as a true different tone in comparison to the roman. Naturally, the essential shape language would be the same, but features like the curved stem endings are clear deviations from a simply slanted form. Those stem endings, and also the way bowls and shoulder strokes exit from the stem, like in n or d, are a reference to true cursive where the flow of the pen makes a transition instead of a separate line that exits at an angle (see illustration 64). In addition to those traits, the design features a single story a of true italic construction, which also resonates well with the form of the g (see illustration 65), as well as an f that extends beyond the baseline. This italic also reflects the humanist design heritage and seemed more true to the character of the already existing design of the roman fonts.

ILLUSTRATION 64: Some features hinting at cursive in the stem exits of shoulders or bowls, and terminations and spurs of vertical strokes.

ILLUSTRATION 65: Comparison of **Silta** regular and italic with italic construction of lowercase letters a and f.

4.4 Testing

Despite this being a design intended for screen usage, the design process often benefited from actual paper print outs of sample texts. Aside from forming an actual physical rendering of the typeface for evaluation, the commentary or sketches made on test prints often served as a list of next steps and adjustments that directed the work process. Equally, a consecutive print out can be held in reference to a previous one and allows for immediate validation of improvements, whereas comparing different digital versions can be more cumbersome and less tangible. For these tests often sample words or terms would be used, but other times I also tested with different generated or reference word lists. Three online tools in particular often were helpful for testing strings and the appearance of the typeface. Just Another Foundry offers a generator[26] that worked great for testing partial charsets as well as overall impression of different language charsets. Pablo Impallari's type tester[27] shines through the multitude of different types of tests all combined into one, and Miguel Sousa's tester[28] is more rudimentary, but great for picking actual words matching given input characters. Additionally, I also created a script for extracting strings from input text files that match the particular charset of the typeface[29]. Those printed tests, as well as testing the typeface in continuous text setting, ensure a certain amount of versatility in the typeface. After all, the typeface might eventually find use in many unforeseen contexts outside the specific use case restrictions of interface typography.

[26] http://justanotherfoundry.com/generator

[27] http://www.impallari.com/testing/index.php

[28] http://www.adhesiontext.com/

[29] The script was coded in Python and reads in any type of text file and finds words in it that match the available characters of the input UFO file as well as restrictive parameters like width or characters. Available at: https://github.com/kontur/typeface-strings

Throughout the design one of the quick tests for interface suitableness of the typeface was to replace the default fonts used by popular websites with **Silta** through the browser console[30]. Different Wikipedia pages provide a good test for previewing actual text in different languages (see illustration 66), while replacing the text on some news sites showed the typeface in use in typographically more diverse hierarchies (see illustration 67). This method

[30] For example inserting the following CSS declaration via the browser inspector quite far reachingly overwrites all the website's text to use the locally installed font:
* { font-family: "Silta" !important; }

ILLUSTRATION 66: Previewing unfamiliar languages and the appearance of diacritics by browsing various language's Wikipedia and setting **Silta** as the default browser font, thus applying it to the body text.

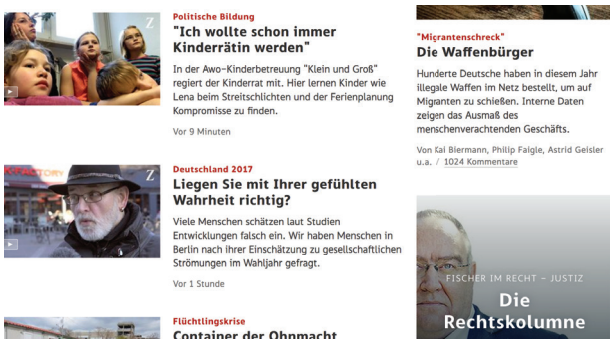


ILLUSTRATION 67: Testing the **Silta** typeface in natural context. By temporarily swapping the browser rendering of a newspaper website (here, zeit.de) different languages and the effect of different weights in a hierarchy can be tested quickly.

of testing is of course flawed in the sense that the paddings, line-heights and other factors are not necessarily ideal after a simple switch in typeface. Nonetheless, it proved an effective way to preview the typeface in different, real, use cases.

Aside from previewing text strings in the font editor software two other methods were very useful throughout the process. The Glyphs editor comes with a companion app for previewing the work area on a linked mobile device. Although I did not use this method continuously, it was one way of verifying the rendering of glyphs from different pixel density displays. Also the form factor of physically seeing the type in a possible use medium and size was a beneficial added bonus. In regard to testing for small sizes and the extent of this thesis, the typeface only contains PostScript hinting and TrueType hinting is merely an automatically generated option for the web-font version.

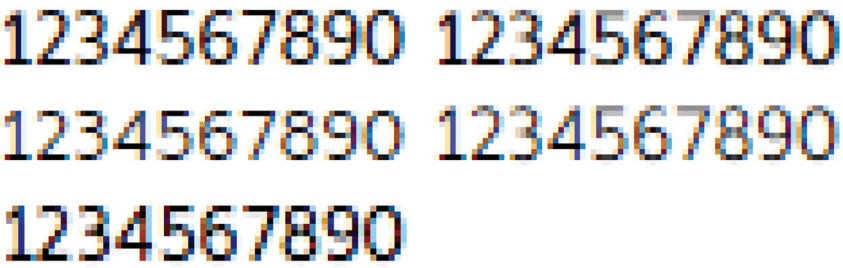


ILLUSTRATION 68: Preview screenshots of the **Silta** typeface rendered at 9 pixels in different file versions and hinting configurations. Note in particular the sharpness of vertical stems in 1, 4 and 5, and the sharpness of horizontal serifs and bars in 1, 2, 4, 5 and 7. TOP LEFT: OpenType, manually hinted, Chrome browser on Windows 10 TOP RIGHT: OpenType, without hints, Chrome browser on Windows 10 MIDDLE LEFT: TrueType, automatically hinted, Chrome browser on Windows 10 MIDDLE RIGHT: TrueType without hints, Chrome browser on Windows 10 BOTTOM LEFT: OpenType rendered without regard to included hinting, Chrome browser on Macintosh 10.12

While some systems like Macintosh and iOS do not utilize any hinting instructions at all when rendering the OpenType typeface, some programs like Adobe's Creative Suite do use the embedded PostScript hints. Exporting intermediary preview OpenType files into a dedicated folder that will automatically refresh the fonts when used in software like InDesign was invaluable in testing and tweaking the hinting. While it is still somewhat cumbersome to generate new font files and switch software after each change, it was still a lot more easy than to export and re-install a font and then restart the design software after each alteration.

While previewing and iteratively adjusting the design is inherent to the design process, one example where testing had an influential and direct effect is in regard to the terminals. For quite a long phase during the design

all terminals were cut off at a perpendicular angle, the line of the cut aimed towards the center of any round terminals. This resulted in terminals that, at medium size, would have an diagonal cut that gets anti-aliased, often to blurry and imprecise effect. After testing different versions (see illustration 57 on *page 65*) and verifying that different stroke terminations would indeed result in a cleaner appearance, the entire font was reworked to have stroke ends with strictly vertical cuts. Aside from the rendering crispness, this alteration further stressed the open aperture in characters like a, c or s. When the terminal's ending cut is sidewards facing, the tendency to optically close the rounded shape is even less perceivable.

4.5 Distinctive features

Many of the design decisions for this typeface have already been pointed out in the previous chapters. The following summary focuses on details that make this typeface especially suitable for interface typesetting as well as define its unique character overall.

4.5.1 Legibility enhancing traits

With the particular attention to legibility and following through on the argument that interface typesetting requires absolutely unmistakable glyph shapes, several groups of letters in this typeface have been designed especially with this in mind.

Of the most obvious examples, the letters of the group of uppercase O and number zero (0) are hardest to differentiated solely by their shapes. While the zero is decidedly less wide and more upright, the characteristics of the uppercase O are most of all in curve tension, when compared to other round capitals. Additionally, the typeface has an OpenType feature to activate a special, more distinct, slashed version of the zero (0). While often the design of this slashed zero is created by intersecting the regular zero with a slash, this introduces another countability to the Danish Oslash (Ø). After some research into the different ways of constructing slashed or distinct zeros (see illustration 70) from other references, the unusual form constructed from a backslash appeared most satisfactory. There are no other characters that this is directly confusable with, and aesthetically it blends in with the rest of the design.

ILLUSTRATION 69: Characters from the **Silta** typeface
LEFT TO RIGHT: Lowercase o, uppercase O, uppercase Danish slashed O (Ø), zero, slashed zero.

ILLUSTRATION 70: Samples of some explicit zero variations.
LEFT TO RIGHT: Slashed zero of **Clear Sans** (Intel), default zero of **Input** (FontBureau), zero of **Pragmata** (FSD), zero of **Anonymous** (Mark Simonson), old-style zero of **Whittingham** (Berthold)

Another group that has already been pointed out in previous examples are vertical stem characters that, depending on their construction, can be mistaken for one another: I, l, 1, and additionally i, | (bar) and ! could be included as well. The alterations that make these explicitly distinguishable glyphs

ILLUSTRATION 71: Explicit glyphs in the **Silta** typeface.
LEFT TO RIGHT: Uppercase I, lowercase l, number one, lowercase i, bar, exclamation mark.

can be reviewed from two standpoints. On the one hand, there inherently is the question if, with these constructions, the glyphs do indeed differ enough from one another. While for example I and l are very clearly of a different shape, the addition of bottom serifs to the 1 also result in a shape that is close to the I. In the case of the i a generous distance between stem and tittle could have been enough, but the addition of the serif was inspired by research (see *Beier and Dyson,* 2014) on the improved legibility from such a solution. On the other hand, the overall stylistic suitableness of such features to the rest of the charset it crucial. Just because they are sufficiently different from one another does not mean they fit in. In fact, often such differentiation is disregarded precisely on the grounds that a glyph looks out of place amongst other characters. In this typeface, the capital I certainly is one of those questionable solutions that sacrifice elegance at the expense of legibility. Other solutions like the curved l terminal might seem odd in isolation, but can in turn influence the overall design. For example for the lowercase t a version with or without round baseline terminal could have been an option, but since the l profited from such a feature, the decision to include it in t as well and increase overall cohesion was beneficial.

ILLUSTRATION 72: Several typefaces viewed at same point size and arranged from top to bottom in a subjective order from humanists with modulated and open froms to grotesques with constructed and closed forms.
TOP TO BOTTOM:
Gill Sans
Fira Sans
Lucida Grande
Myriad Pro
Silta
Segoe UI
Acumin Pro
San Fransisco UI Text

4.5.2 Aesthetic traits

Inevitably any typeface also needs to find a coherent stylistic tone. As the discussion on neutrality in *chapter 3.4.2* made evident, no design is ever without character. Clearly, for this typeface, the aim was a design that was restrained in character, as is often the case for interface typefaces that are intended to be widely applicable. The decision to explore letter construction that follows in the vein of humanist sans serifs also was a basic decision on mood and feel of the type. In comparison to geometric or grotesque sans serifs the influence of the underlying pen stroke generally lends itself to a warm and friendly tone. Historically, the first famous representatives of humanist inspired sans serifs, like Johnston's 1916 signage face for the London underground, were also attracted by the humanist letter construction and open shapes, which their designers deemed highly legible. It is letters like the round terminal l in **Silta** that seem all the more plausible in this genre, as compared to, for example, in neo-grotesques, where such an addition for the sake of legibility might stand out as too exotic for a typeface of that heritage.

While the italic was not integral to the early design, it is partially in conclusion from the chosen construction model for the roman that allowed this very expressive and contrasting italic. This choice is also an expression of current typographic taste that shows increasing appreciation for italics that are explicitly designed as separate alphabet, as opposed to simply an oblique version of the roman. For example, Frutiger's typeface for the Roissy

airport, later named eponymous after its creator, originally featured only a slanted oblique, whereas in the re-release as **FrutigerNext** an italic was added by the foundry against Frutiger's personal recommendation (*Osterer and Stamm,* 2014, PP. 257). Although this is just one example it lays testimony to this shift in fashion.

One other characteristic feature in **Silta** is the recurring rounded cap on ascenders and descenders, which is also mirrored in the serifs of i and j. While terminals in the horizontal direction are sharply cut at a straight angle, vertical terminals received this rounded cap as a means to increase a wavy and soft horizontal contour of the lowercase (see illustration 73). In the ascenders and descenders this curved cap is intended to visually guide the readers' eye forward along the line, and is pointed in an slight upwards direction to stress the more important (in terms of identifying letter shapes) top contour of words. Equally, the bars in f and t, as well as the serifs in i and j, give a slight rounded and upwards leading momentum to the eye skimming across a row of letters. When compared to a line set in a type where these features are absent, the contrast in the interplay of hard stroke ends and round shapes is more spiked. While this stronger rhythm might also increase readability, the intended positive effect of a more flowing contour arguably is a stronger formation of word-wholes in the context of interfaces.

ILLUSTRATION 73: Two versions of **Silta**. LEFT: Stems end straight and without spurs RIGHT: Final version with stems ending in tapered, rounded spurs that make the stem lighter on the bowl or shoulder side of the character.

As already mentioned, this shape of rounded cap is echoed in the x-height spurs of n, m and r, the spurs of bowled characters p, q and g, as well as the baseline spurs of a, b and d. On the one hand, the intention with reiterating the same shape in the vertical direction is to create a unified form language within the typeface, which amplifies its character through repetition in many glyphs. On the other hand, the spurs in all these characters help maintain sharp and of equal colour in the corners of joins. These spurs work the same way as ink traps do in types for printing at small sizes. Instead of ink spread, the detrimental effect of anti-aliasing is averted by adding additional white space. This is also a feature that was observed in some of the

ILLUSTRATION 74: Comparing different styles and size ink traps. Although more modulated in earlier designs, the extent of thinning towards joins in **Silta** is minimal in the final version and only serves to prevent the joins from clotting.
TOP: **Amplitude**
MIDDLE: **PT Sans**
BOTTOM: **Silta**

reference typefaces inspected in *Appendix II*. Consequently, the shapes of those «pixel traps» are another reference to those same rounded forms already pointed out in the caps of ascenders and descenders. Instead of angled corners, those narrowed joins and crotches show smooth transition towards the junction and help visually balance darkness at the connection point (see illustration 74).

4.6 Recapping the Silta typeface

In retrospect the typeface fulfils the initial specification of an interface typeface. Aside from extensive manual TrueType hinting that would be required to ensure maximum control for rendering in older versions of Windows, the typeface performs well in different contexts and sizes. Particularly the expansion into a typeface family makes the design applicable to more typographically challenging settings and gives potential users a proper palette to work with. The typeface in the state as is submitted as part of this thesis is based on three sets of masters for the roman as well as the italic. As the design is now finalized, subsequent production steps will include a closer polishing of each of the generated instances. In particular the range between regular and the heaviest weight would probably benefit from adding another refined master, so that interpolation would never span more than one weight until the next weight master. This could ensure that the characters which are very dense in the heaviest weight, such as a, e, s or k do not show much distortion except for the two heaviest weights. One future addition further supporting the interface use case of this typeface family would be the addition of an icon set tailored to the typeface. While I initially considered this for the scope of the thesis, this notion was disregarded and the focus kept on core type design steps.

As part of familiarizing myself more with historical models and developments in type design I have over the same period of time sketched many other designs aside from this typeface. Some were just single words or studies of a particular style or feature as shown in illustration 70, while others have progressed to rough digital sketches of partial alphabets. While this more general versatility in the design of letter shapes is an essential insight for further type design, the production quality in terms of vector drawing and project work flow has improved vastly, compared to the start of working on this typeface. These versatile studies that were conducted in addition to this main design work clearly informed my understanding of the type design process and positively affected the **Silta** design.

An aspect of typeface design that this thesis project leaves almost entirely untouched is commercial distribution. While in many of my discussions with different type designers the question of how to sell typefaces has

come up, more concrete practical insight would have been a desirable side track. While publishing this typeface family naturally is an option for exploration, the interaction of partnering with a type foundry that functions as editor throughout the design process would clearly have proven to be very beneficial. It is in hindsight and with regards to the genre and design of this particular typeface that I must admit that the design indeed caters to a market niche that is already highly saturated. While the special attention given to legibility and usability in interface typesetting can be described as distinguished attributes of this design, it also is, in its essence, a humanist sans serif amongst hundreds and thousands of others.

And lastly it is also worth scrutinising the design process as part of a thesis. While indeed at the outset of the design work my intention was to investigate the properties of interface typefaces by method of designing one, the research part of this thesis has greatly benefited the design, but also to some degree diverted it from the original starting point. Research into the features of interface typefaces, and then, in consequence, into legibility, has probably influenced the design more than the design of interfaces and the aesthetics related to it. It is surely thinkable that this interface typeface would have become a more expressive design focused on one particular use case. This would have almost certainly have been the case if this thesis project would have been conducted as a commissioned typeface for a specific client, as was initially an option I investigated. However, in its more generic design aesthetics the final typeface also gives a good representation of what categorizes many of the most popular interface typefaces on the market and in use by major soft– and hardware vendors making use of custom or bespoke interface typefaces.

Finally, the strong focus on studying legibility in such detail in the design and the research part of this thesis is overall an excellent basis for further type design. Only when the rules and conventions are sufficiently studied can future designs challenge those. As a novice in the field, this earnest design certainly provided a solid basis on which to base my next typeface designs and explore more unconventional approaches.

ILLUSTRATION 75: Practising sketching and digitizing different styles as part of this thesis' background work.

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5 Conclusions

In this conclusive part I would like draw attention to different aspects in this research that can provide an outlook for future developments.

From a research point of view one of the more intriguing obstacles in the analysis of typefaces, and this is not exclusive to the interface category, is the strong emphasis on already completed work. By reflection on my own experience and the fortunate opportunities to discuss their work with a handful of type designers this text will hopefully provided some insight into the development process of a typeface. How the intended use case and the restrictions it imposes affect the design process is often hard to ascertain by merely inspecting finished designs. Particularly the more and more widespread use of versioning systems and public collaboration tools in the work on open source typefaces possess a valuable resource for future research. As seen in the case of **Roboto**, even typefaces of considerable impact, in terms of audience reach, undergo iterative improvement. The influence of software development on type design practitioners is evident also in this aspect.

In the same vein of collaborative design, and generally a more user-centered design approach, it is probably increasingly feasible also for typeface designers to conduct user testing. This could be testing their own design either explicitly through exposure studies or implicitly in the form of beta previews, as was done with the **Ubuntu** open source typeface. To what degree such a specialized craft as type design can profit from layman user testing remains to be seen, but certainly the aesthetics conveyed via typography are slowly receiving more research attention in regard to their impact on user experience.

More specific to the design of interface typefaces, however, is the actual display technology used to render digital information on ubiquitous mobile computing devices. Although pixel density and screen resolutions are increasing and have made leaps forward over the last years, aspects related to anti-aliasing and hinting still play an important role in the creation of quality typefaces. But while these physical and technical limitations are becoming increasingly less important, the other aspects related to this media come more into focus. Where and how we read and consume media has undergone a dramatic shift. The letters of our alphabet do not transform in big leaps, but how the process of reading itself is transforming surely must have an impact on how those letters are designed to be read.

A possible answer arises from the past. When the term font[31] still referred explicitly to one size rendition of a typeface in little blocks of lead, each font was rooted in the same design, but including different size-specific altera-

[31] Or more historically correct «fount».

tions to ensure legibility and readability. Thinking in physical terms, the effort to have numerous renditions of a typeface in different optical sizes seems staggering, but the digital medium that currently caters only one-size-fits-all fonts is adapting. While explicit different typeface versions also exist in digital form as optical sizes, they are still the exception. Even more of an exception is dynamic support for adaptation like this on operating system level. *Berlow* (2016) commented on the announced Macintosh operating system initiative to automatically select optical sizes of its operating system default font: *"Having size masters around for 500 years was great, but finally having an OS allow – even encourage – size masters might be better"*. It is through the web and the concept of "responsive design" *(Marcotte,* 2010*)* with websites that adapt to the users' browsing devices, that responsive typography has finally gained traction in digital technologies. When *Ahrens* (2016) comments in our interview that *"[l]arge and flexible families or even parametric solutions could help with any responsive typography"*, the recent announcement for the addition of «Variable Fonts» to the OpenType format can do just that[32]. The specification defines digital typefaces that are parametric from their inception on, with however many design axes desired all in one file. Aside from obvious interpolation axes for weight and width, in interface typefaces this could mean an adaptive x-height or opening of aperture for smaller sizes, tighter spacing for bigger elements, all in a seemingly gradual continuum. Similar technologies[33], however, have in the past failed to gain traction for various reasons. OpenType Variable Fonts will equally have to prove that they indeed answer the real needs of users. At the same time the added complexity of using and licensing those types of fonts could be a potential pitfall that is not resolved as of this writing. With webfonts, however, the programmatic alteration of typography in layout has already been introduced to designers. While this might so far have been restricted to rendering text at different sizes for different sized viewports, it shows this approach as viable and indeed profiting the end users' experience.

[32] For an announcement with a good overview see ***Hudson (2016)***

[33] Adobe's Multiple Master and Microsoft's TrueType GX initiatives.

On the whole, interface typeface design is also evolving conceptually. While the earliest typefaces of this genre embody a pragmatic solution to the basic hindrances to legibility and readability that stem from coarse, low resolution screens, contemporary designs have more stylistic leeway. Herein also lies the strongest motivator for design of new interface specific typefaces. For many digital products, like mobile applications, their product design has only the screen interface as a means to distinguish themselves from competition. In this context, interface typography not only serves its functional purpose, but more and more assumes the role as a means to communicate visual identity.

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SILTA

A *friendly* interface

typeface

FAMILY

ranging **7 weights** *and matching italics*

by Johannes Neumeier

Silta Thin

Gud hjälpe Zorns mö qvickt få byxa.

Silta Thin Italic

Pijamalı hasta yağız şoföre çabucak.

Silta Light

Albert osti fagotin ja töräytti puhkuvan.

Silta Light Italic

Public junk dwarves quiz mighty fox.

Silta Regular

Two driven jocks help fax my big quiz.

Silta Regular Italic

Noé, sin vergüenza, la más exquisita.

Silta Medium

Příliš žluťoučký kůň úpěl ďábelské.

Silta Medium Italic

Kæmi ný öxi hér, ykist þjófum nú.

Silta Bold

Glāžšķūņa rūķīši dzērumā čiepj.

Silta Bold Italic

Høj bly gom vandt fræk sexquiz på.

Silta Extra Bold

Pójdźże, kiń tę chmurność w głąb.

Silta Extra Bold Italic

Voyez le brick géant que j'examine.

Silta Heavy

Franz jagt im komplett verwahr.

Silta Heavy Italic

Ma la volpe, col suo balzo, ha.

Basic latin letters

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abcdefghijklmnopqrstuvwxyz

Extended latin letters

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Basic latin letters

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Silta Thin

Korisničko sučelje je mjesto susreta odnosno dodira između operatera (osobe) i nekog stroja, sistema ili naprave. Primerice korisničko sučelje kod vozila sačinjeno je od: raznih papučica (kvačilo, kočnica, ubrzanje), ručne kočnice, mjenjača brzina, volana i raznih indikatora, te instrumentalnog panela, i stakla koji omogučava pregled okoliša u kojem se kreće vozilo. Indikatori omogučavaju operateru da napravi

Silta Light

Les interactions homme-machines (IHM) définissent les moyens et outils mis en œuvre afin qu'un humain puisse contrôler et communiquer avec une machine. Les ingénieurs en ce domaine étudient la façon dont les humains interagissent avec les ordinateurs ou entre eux à l'aide d'ordinateurs, ainsi que la façon de concevoir des systèmes qui soient ergonomiques, efficaces, faciles à utiliser ou plus

Silta Regular

The user interface (UI), in the industrial design field of human–computer interaction, is the space where interactions between humans and machines occur. The goal of this interaction is to allow effective operation and control of the machine from the human end, whilst the machine simultaneously feeds back information that aids the operators' decision-making process. Examples of this

Silta Medium

L'interfaccia utente, anche conosciuta come UI (dall'inglese User Interface), è ciò che si frappone tra una macchina e un utente, consentendo l'interazione tra i due. In generale può riferirsi a macchina di qualsiasi natura, tuttavia l'accezione più nota è in ambito informatico. Nel senso generale del termine, un'interfaccia è l'area o la superficie sulla quale due entità qualitativamente

Silta Bold

Käyttöliittymä on se laitteen, ohjelmiston tai minkä tahansa muun tuotteen osa, jonka kautta käyttäjä käyttää tuotetta. Esimerkiksi tietokoneohjelmassa käyttöliittymä tarkoittaa sitä ohjelman osaa, jonka käyttäjä näkee tietokoneen näytöllä, ja sitä tapaa (hiiri, näppäimistö), jolla hän käyttää ohjelmaa. Käyttöliittymä voidaan määritellä myös tuotteen viesteistä ja

Silta Extra Bold

La interfaz de usuario es el medio con que el usuario puede comunicarse con una máquina, equipo, computadora o dispositivo, y comprende todos los puntos de contacto entre el usuario y el equipo. Normalmente suelen ser fáciles de entender y fáciles de accionar, aunque en el ámbito de la informática es preferible referirse a que suelen ser "amigables

Silta Heavy

Používateľské rozhranie alebo užívateľské rozhranie alebo rozhranie človek–stroj sú programy a zariadenia, ktoré sú k dispozícii používateľovi systému na spracovanie dát. Môže byť pre rôznych používateľov stanovené rôzne; napr. operátori majú v porovnaní s normálnym používateľom spravidla prístup k podstatne väčšiemu počtu funkcií.

Silta Thin Italic

Korisničko sučelje je mjesto susreta odnosno dodira između operatera (osobe) i nekog stroja, sistema ili naprave. Primerice korisničko sučelje kod vozila sačinjeno je od: raznih papučica (kvačilo, kočnica, ubrzanje), ručne kočnice, mjenjača brzina, volana i raznih indikatora, te instrumentalnog panela, i stakla koji omogučava pregled okoliša u kojem se kreće vozilo. Indikatori omogučavaju operateru da napravi odluke prilikom vožnje.

Silta Light Italic

Les interactions homme-machines (IHM) définissent les moyens et outils mis en œuvre afin qu'un humain puisse contrôler et communiquer avec une machine. Les ingénieurs en ce domaine étudient la façon dont les humains interagissent avec les ordinateurs ou entre eux à l'aide d'ordinateurs, ainsi que la façon de concevoir des systèmes qui soient ergonomiques, efficaces, faciles à utiliser ou plus généralement adaptés à

Silta Regular Italic

The user interface (UI), in the industrial design field of human–computer interaction, is the space where interactions between humans and machines occur. The goal of this interaction is to allow effective operation and control of the machine from the human end, whilst the machine simultaneously feeds back information that aids the operators' decision-making process. Examples of this broad concept of

Silta Medium Italic

L'interfaccia utente, anche conosciuta come UI (dall'inglese User Interface), è ciò che si frappone tra una macchina e un utente, consentendo l'interazione tra i due. In generale può riferirsi a macchina di qualsiasi natura, tuttavia l'accezione più nota è in ambito informatico. Nel senso generale del termine, un'interfaccia è l'area o la superficie sulla quale due entità qualitativamente

Silta Bold Italic

Käyttöliittymä on se laitteen, ohjelmiston tai minkä tahansa muun tuotteen osa, jonka kautta käyttäjä käyttää tuotetta. Esimerkiksi tietokoneohjelmassa käyttöliittymä tarkoittaa sitä ohjelman osaa, jonka käyttäjä näkee tietokoneen näytöllä, ja sitä tapaa (hiiri, näppäimistö), jolla hän käyttää ohjelmaa. Käyttöliittymä voidaan määritellä myös tuotteen viesteistä

Silta Extra Bold Italic

La interfaz de usuario es el medio con que el usuario puede comunicarse con una máquina, equipo, computadora o dispositivo, y comprende todos los puntos de contacto entre el usuario y el equipo. Normalmente suelen ser fáciles de entender y fáciles de accionar, aunque en el ámbito de la informática es preferible referirse a que suelen ser

Silta Heavy Italic

Používateľské rozhranie alebo užívateľské rozhranie alebo rozhranie človek-stroj sú programy a zariadenia, ktoré sú k dispozícii používateľovi systému na spracovanie dát. Môže byť pre rôznych používateľov stanovené rôzne; napr. operátori majú v porovnaní s normálnym používateľom spravidla prístup k

Silta Extrabold
Silta Thin
Silta Medium Italic
Silta Regular
Silta Bold

User interface

From Wikipedia, the free encyclopedia

For the boundary between computer systems, see Interface (computing). For other uses, see Interface (disambiguation).

The **user interface** (**UI**), in the industrial design field of human–computer interaction, is the space where interactions between humans and machines occur. The goal of this interaction is to allow effective operation and control of the machine from the human end, whilst the machine simultaneously feeds back information that aids the operators' decision–making process. Examples of this broad concept of user interfaces include the interactive aspects of computer operating systems, hand tools, heavy machinery operator controls, and process controls. The design considerations applicable when creating user interfaces are related to or involve such disciplines as ergonomics and psychology.

Silta Extrabold
Silta Thin
Silta Medium Italic
Silta Regular
Silta Bold
Silta Light Italic

Interface do utilizador

Origem: Wikipédia, a enciclopédia livre.

Nota: Se procura pelo conceito amplo de interface, veja Interface.

A **interface do utilizador** *(português europeu)* ou **interface de usuário** *(português brasileiro)*, no campo de desenho industrial da interação homem–máquina, é o espaço onde a interação entre humanos e máquinas ocorre. O objetivo desta interação é a operação e controle efetivos da máquina no lado do usuário e o feedback da máquina, que auxilia o operador na tomada de decisões operacionais. Exemplos deste amplo conceito de interfaces de usuário incluem os aspectos interativos dos sistemas operacionais do computador, ferramentas de mão, controles de operador de máquinas pesadas e controles de processo. As considerações de design aplicáveis na criação de interfaces de usuário estão relacionados ou envolvem disciplinas como ergonomia e psicologia.

Silta Extrabold
Silta Thin
Silta Regular
Silta Bold
Silta Light Italic

Brugergrænseflade

Fra Wikipedia, den frie encyklopædi

En **brugergrænseflade** er det hvorved et menneske (brugeren) interagerer med en bestemt maskine, udstyr, software eller andre komplekse værktøjer (systemet).

Silta Thin
Silta Bold
Silta Regular
Silta Regular Italic

Chapter Four
Miss Bürstner's Friend

For some time after this, K. found it impossible to exchange even just a few words with Miss Bürstner. He tried to reach her in many and various ways but she always found a way to avoid it. He would come straight home from the office, remain in her room without the light on, and sit on the sofa with nothing more to distract him than keeping watch on the empty hallway. If the maid went by and closed the door of the apparently empty room he would get up after a while and open it again. He got up an hour earlier than usual in the morning so that he might perhaps find Miss Bürstner alone as she went to the office. But none of these efforts brought any success. Then he wrote her a letter, both to the office and the flat, attempting once more to justify his behaviour, offered to make whatever amends he could, promised never to cross whatever boundary she might set him and begged merely to have the chance to speak to her some time, especially as he was unable to do anything with Mrs. Grubach either until he had spoken with Miss Bürstner, he finally informed her that the following Sunday he would stay in his room all day waiting for a sign from her that there was some hope of his request being fulfilled, or at least that she would explain to him why she could not fulfil it even though he had promised to observe whatever stipulations she might make. The letters were not returned, but there was no answer either. However, on the following Sunday there was a sign that seemed clear enough. It was still early when K. noticed, through the keyhole, that there was an unusual level of activity in the hallway which soon abated. A French teacher, although she was German and called Montag, a pale and febrile girl with a slight limp who had previously occupied a room of her own, was moving into Miss Bürstner's room. She could be seen shuffling through the hallway for several hours, there was always another piece of clothing or a blanket or a book that she had forgotten and had to be fetched specially and brought into the new home.

When Mrs. Grubach brought K. his breakfast – ever since the time when she had made K. so cross she didn't trust the maid to do the slightest job – he had no choice but to speak to her, for the first time in five days. *"Why is there so much noise in the hallway today?"* he asked as she poured his coffee out, *"Can't something be done about it? Does this clearing out have to be done on a Sunday?"* K. did not look up at Mrs. Grubach, but he saw nonetheless that she seemed to feel some relief as she breathed in. Even sharp questions like this from Mr. K. she perceived as forgiveness, or as the beginning of forgiveness. *"We're not clearing anything out, Mr. K.,"* she said, *"it's just that Miss Montag is moving in with Miss Bürstner and is moving her things across."* She said nothing more, but just waited to see how K. would take it and whether he would allow her to carry on speaking. But K. kept her in uncertainty, took the spoon and pensively stirred his coffee while he remained silent. Then he looked up at her and said, *"What about the suspicions you had earlier about Miss Bürstner, have you given them up?"* *"Mr. K.,"* called Mrs. Grubach, who had been waiting for this very question, as she put her hands together and held them out towards him. *"I just made a chance remark and you took it so badly. I didn't have the slightest intention of offending anyone, not you or anyone else. You've known me for long enough, Mr. K., I'm sure you're convinced of that. You don't know how I've been suffering for the past few*

Valerie Phil!
“Abraham?”
Fabian Tyler
‹Guinevere›
Maria, Doris
Glen & Julie

@Gregory7

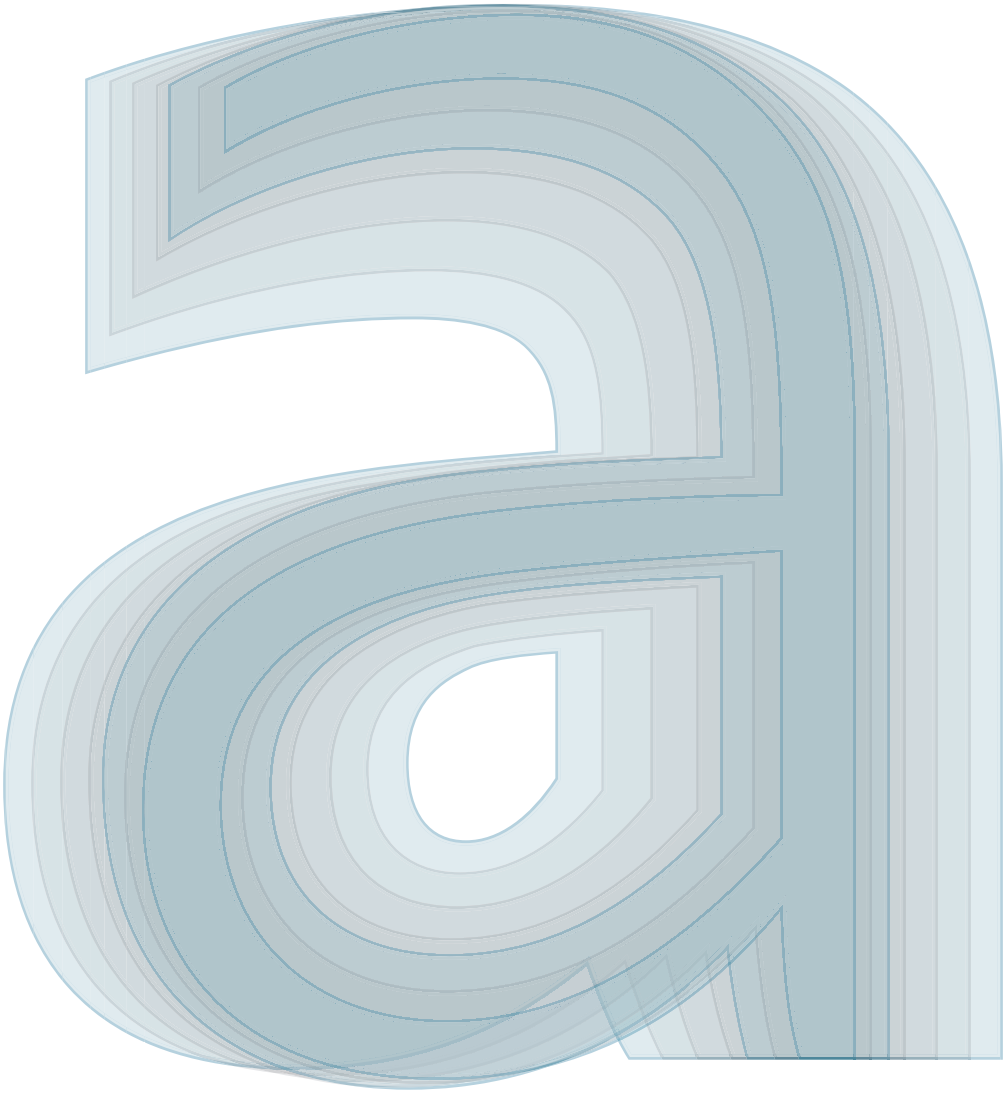
Lucy; David

‘Coco Kerry’

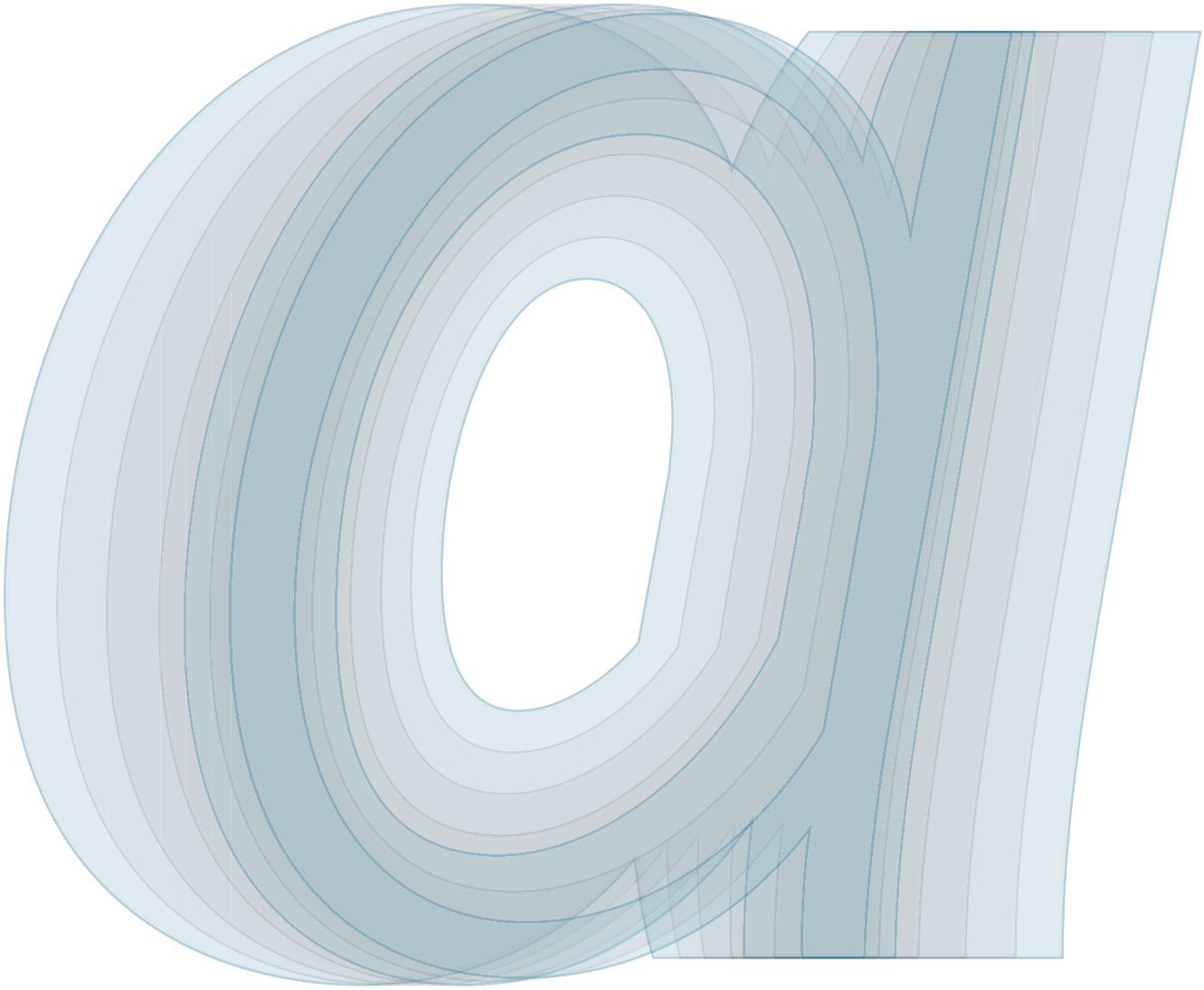
Axel Diane!

“Dwayne?!”

Adam·Kylie



aA aA **aA** aA aA aA **aA**



aA aA ***aA*** *aA* ***aA*** ***aA*** ***aA***

Confident *tone*

GREAT

legibility

mųłţìļīñġűăľ čħąŕşēŧ

tabular

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&

proportional

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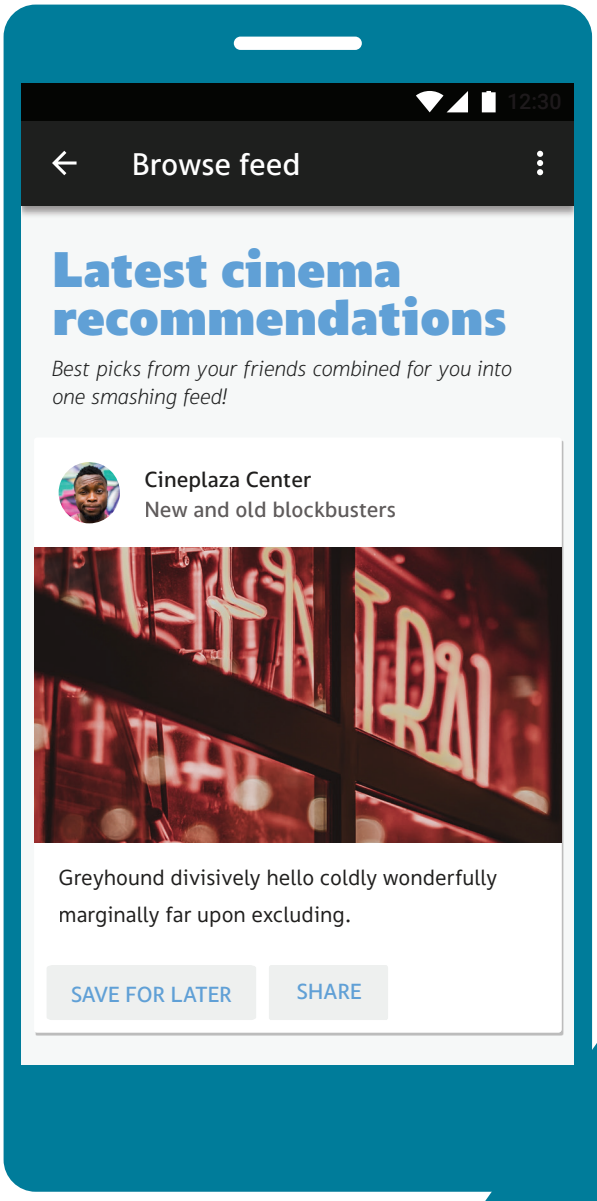
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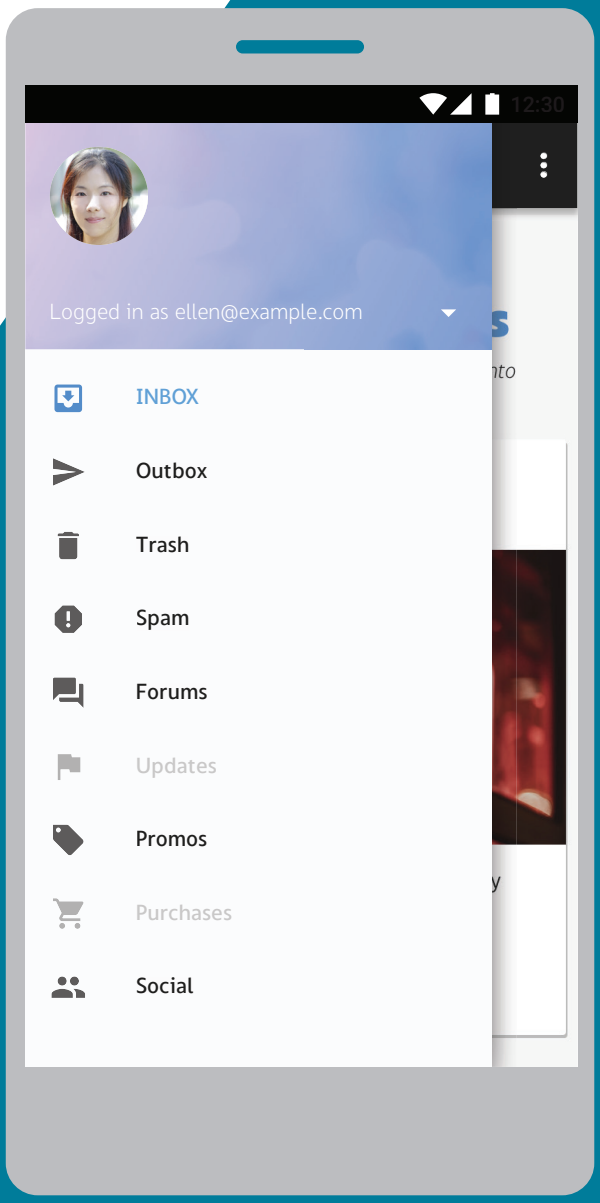
Browse feed
Latest cinema recommendations
Best picks from your friends combined for you into one smashing feed!
Cineplaza Center
New and old blockbusters
Greyhound divisively hello coldly wonderfully marginally far upon excluding.
SAVE FOR LATER
SHARE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Appendix II

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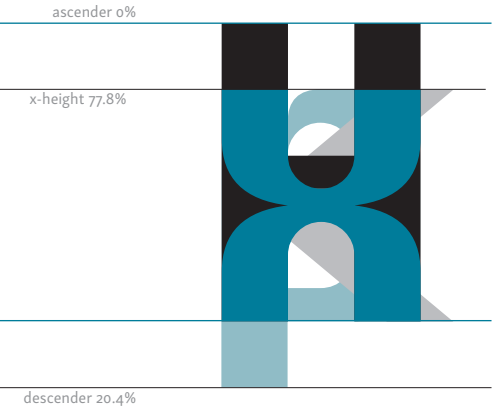
Comparison and analysis of interface typeface samples

Appendix II: Comparison and analysis of interface typeface samples

This appendix presents several typefaces used in interface typesetting. Some of the examples were designed prominently as interface typefaces, for example various featured operating system fonts, while others are more general workhorse types that happen to find application also in interface typesetting.

This selection is in part a representation of reference analysis done for the design of the Silta typeface. Scrutinizing these samples helped establish what are interface typeface specifics, and what, in turn, are idiosyncratic features of a particular design.

Each typeface featured is shown in a basic Latin character set as well as several sizes of paragraph and word samples for comparison. The illustrations at the head of each page compare the typefaces at same capital height, so that their x-heights, ascenders and descenders can be compared. The numerical values for those are always in relation to their cap height. For ascenders, this means the amount they protrude past the cap height, and for descenders this refers to the depth below the baseline. Further it should be noted that those values are in fact measured from the outlines of the digital fonts and correspond to the actual measurement, which does not necessarily coincide with the ascender and descender values that are embedded in the font's meta information. In cases where the terminal cap is slanted or diagonal, the extremum was referenced. At the bottom of each specimen a few words are set in larger size to showcase some of the particular characteristics in shapes and character of that typeface.



Chicago

Symbolizing the transition from bitmap fonts to TrueType, this operating system typeface for early Apple products this is a good example for a typeface used as integral part of product branding. Legibility suffers from the overly stylized and repetitive forms, which, in part, result from the pixel grid restraint.

Design: Susan Kare (initial), Charles Bigelow and Kris Holmes (TrueType redesign)

Release: 1984 (initial)

Application: Macintosh operating system

24pt

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m
n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 ! & –

8/10pt

minimum milliliter o0000 Jll1| rn m rm nn oec ftli

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bedding was hardly able to cover it and seemed ready to slide off

12/14pt

minimum milliliter o0000 Jll1| rn m rm nn oec ftli

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his

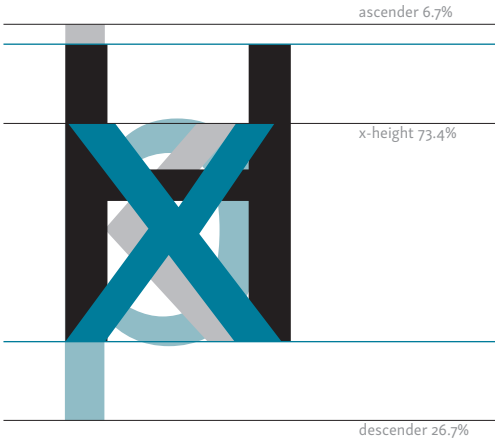
42pt

Vowels Namely OHO!

AHOU	Underlying squarish shape with bevelled corners
acegjs	Thin terminals
Vw	Distinct one-sided
NM	Overemphasised diagonals
Hx	Very large x-height

Lucida Sans

A humanist sans serif with large apertures, wide proportions and attention to legibility in small sizes. Originally developed as typeface with large charset coverage for TeX typesetting it was later adopted as the operating system default font for the Macintosh operating system.



Design:	Charles Bigelow, Kris Holmes
Release:	1985 (initial)
Application:	Designed for screen display at small sizes, TeX typesetting, Macintosh operating system default

24pt

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m
n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 ! & %

8/10pt

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour–like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bedding was hardly able to cover it and seemed ready to slide off any moment. His many legs, pitifully thin compared with the

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Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his ar–mour–like back, and if he lifted his head a little he could see his brown belly, slightly domed and

minimum
milliliter
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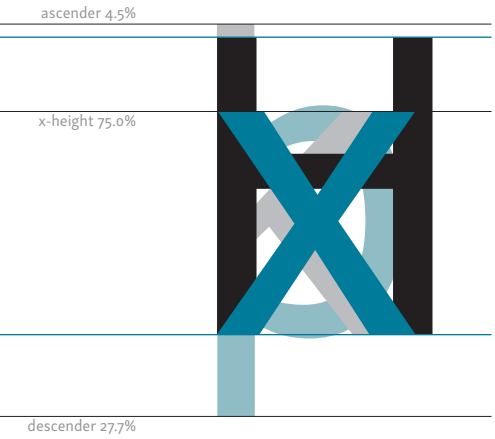
rn m rm nn
oec ftli

42pt

Rarest Cough Jill Q72&

Vertically cut terminals
Large apertures with flaring terminals
Humanist writing influence

acCersS2
acCes
aQ78&



Tahoma

Humanist sans serif designed as the default operating system font in early Windows versions. It has a distinctly narrow appearance and its hinting was crafted, although a TrueType font, with close attention to the rendered pixel appearance, akin to a bitmap font.

Design:	Matthew Carter (Microsoft)
Release:	1994
Application:	Operating system typeface for Windows

24pt

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m
n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 ! & %

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12/14pt

minimum
milliliter
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rn m rm nn
oec ftli

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections.

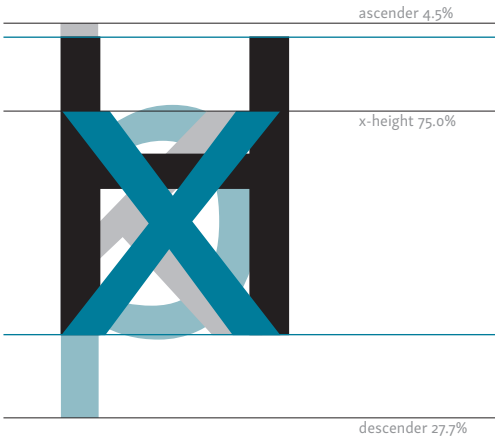
42pt

Crest Bake Jiffy Rockstars

cCesS	Large apertures with flaring terminals
fjrst	Vertically cut terminals
IJj1	Distinct character shapes
BEKSces	Some very wide characters with big counters
nn	Tight horizontal appearance

Verdana

Release in tandem with Tahoma, the two designs share much commonalities, but Verdana differs significantly in width. This more open and wide character makes it more suited to reading, as opposed to typesetting interface elements.



Design:	Matthew Carter (Microsoft)
Release:	1996
Application:	General screen reading

24pt

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m
n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 ! & %

8/10pt

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bedding was hardly able to cover it and seemed ready to slide off any moment. His many legs, pitifully

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Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly

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milliliter
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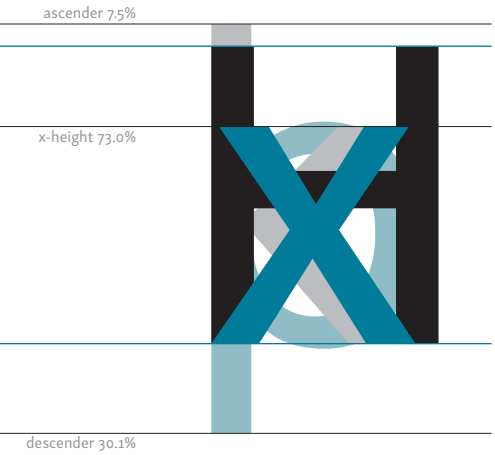
rn m rm nn
oec ftli

42pt

Crest Bake Jiffy Rocks

Large apertures with flaring terminals
Vertically cut terminals
Distinct character shapes
Some very wide characters with big counters

cCesS
fjrst
IJj1
BEKSces



Frutiger

A decendant of Frutiger's earlier designs «Concorde» and a signage typeface for the Roissy Airport Paris, this typeface utilizes the good legibility qualities of humanist sans serifs. Its open apertures and large x-height established it as a prototype for signage and wayfinding, but it is of a widely applicable character and as such has also inspired interface typeface design.

Design:	Adrian Frutiger (Linotype)
Release:	1975 (initial)
Application:	General purpose typeface, based on a signage typeface design

24pt

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m
n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 ! & %

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12/14pt

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milliliter
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rn m rm nn
oec ftli

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided

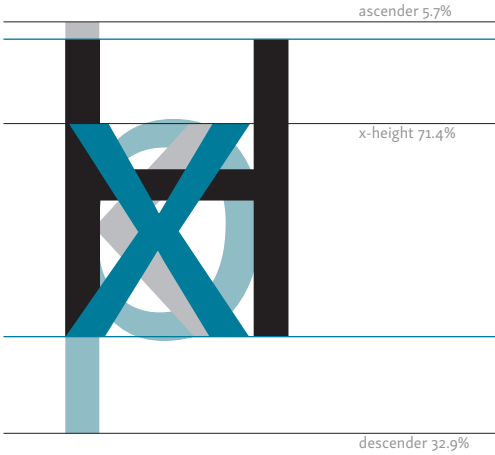
42pt

Cleaver Gorgeous Shifty

CSVacegs	Open aperture
CJaefrt23	Vertically cut stroke terminations
ij!	Square dots
ft	Bars of f and t extending far to the left

Segoe UI

Designed as an humanist interface font for use in Microsoft products (originally developed by Agfa Monotype) this font bears similarities to Tahoma and Frutiger, but has some more sharp geometric shapes and angular features. Here shown is one of the first iterations of this typeface, which has since undergone minor changes.



Design:	Steve Matteson (Microsoft Typography)
Release:	2004
Application:	Various Microsoft applications, Windows 10 operating system

24pt

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m
n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 ! & %

8/10pt

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bedding was hardly able to cover it and seemed ready to slide off any moment. His many legs, pitifully thin compared with the size of the rest of him, waved about helplessly as

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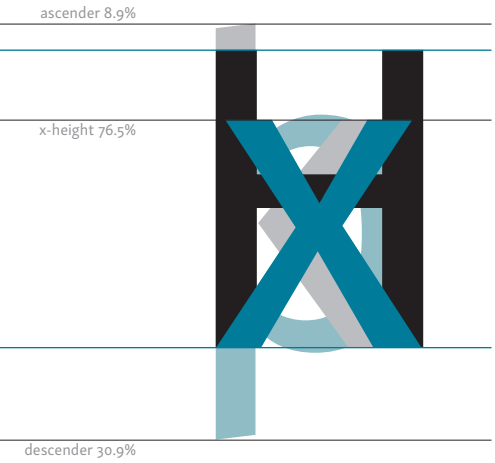
Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bed

minimum
milliliter
oOØ00
JIl1|
rn m rm nn
oec ftli

42pt

Strict Xeon Inkling Clearly

Straight vertical cuts on terminals	CSJrft36
Optical compensation in crotch and stem connections	JIl1
Sharp and angular shapes	r6v
Distinct differentiation of confusable characters	KZM



Fira Sans

A humanist sans serif loosely based on the popular 1990s typeface Meta, also designed by Spiekermann. It retains the vertical dense look of Meta, but without the straight stem endings. Commissioned as open source font by the Mozilla Foundation.

Design:	Erik Spiekermann, Ralph du Carrois
Release:	2013
Application:	Firefox OS

24pt

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m
n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 ! & %

8/10pt

minimum
milliliter
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JIl1|
rn m rm nn
oec ftli

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bedding was hardly able to cover it and seemed ready to slide off any moment. His many legs, pitifully thin compared with the size of the rest of him, waved about

12/14pt

minimum
milliliter
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JIl1|
rn m rm nn
oec ftli

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff

42pt

Quest Sport Miller 8 Bag

nmuhHND	strong verticals and condensed horizontal proportions
ltjJ	curved terminals
Qga	Expressive terminals and ears
ltkpqdbh	Asenders and descenders cut at an angle
M	Splayed legs, vertex above the baseline

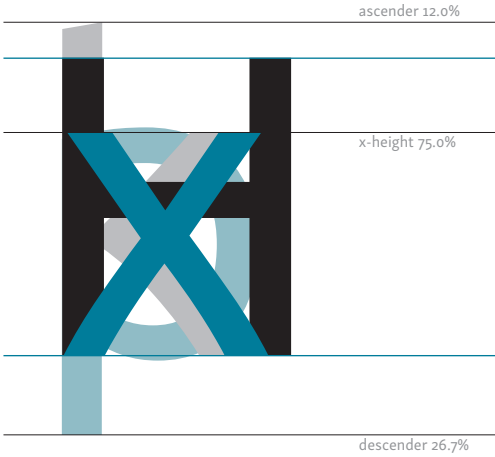
Ubuntu

Created as the default system and brand typeface for Canonical's Ubuntu operating system. The face has noteably stylized features and a neo-humanist construction with generous round features. For an interface typeface it has very expressed character.

Design: Daalton Maag

Release: 2010

Application: Ubuntu desktop OS



24pt

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m
n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 ! & %

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bedding was hardly able to cover it and seemed ready to slide off any moment. His many legs, pitifully thin compared with the size of the rest of him, waved about

8/10pt

minimum
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rn m rm nn
oec ftli

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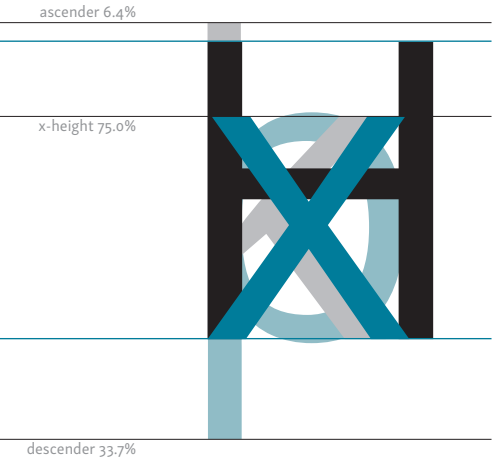
12/14pt

minimum
milliliter
oOØ00
Jll1|
rn m rm nn
oec ftli

42pt

Mate Image Clock Baftas

Curved diagonals with very dynamic tension — VNk7
Spurless minuscules with high shoulder — nmpbqdga
Bowled capitals with overshoot — BDPR
Left bar ommitted in f and t — ft
Open counters with terminals at an angle — ctl
Minuscules asender cap angled — dbhklt



Open Sans

Related to the earlier released Droid Sans, also commissioned by Google from the same designer. The design is a humanist sans with general purpose usefulness featuring a notably wide appearance.

Design:	Steve Matteson (Ascender Corp)
Release:	2011
Application:	Various Google applications

24pt

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m
n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 ! & %

8/10pt

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milliliter
oOØ00
Jll1 |
rn m rm nn
oec ftli

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bedding was hardly able to cover it and seemed ready to slide off any moment. His many legs, pitifully thin compared with the size of the rest of him

12/14pt

minimum
milliliter
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Jll1 |
rn m rm nn
oec ftli

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into

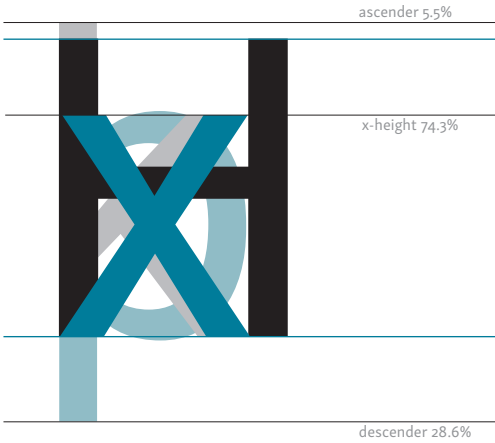
42pt

Before Rig Haste Superb

BHDS	Capitals with modern proportions of even width
CFSDcsx	Very open aperture and generous counters
noOUM2	Spacious in horizontal direction
arnmhdbqp	Angled spurs and ink traps
tf	Bars in t and f with sharp asending edge

Roboto

Operating system font for the Android environment with quite blocky and robust characteristics. A neo-grotesque of mixed character with some typical problematic characters.



Design:	Christian Robertson (Google)
Release:	2012
Application:	Android operating system

24pt

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m
n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 ! & %

8/10pt

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bedding was hardly able to cover it and seemed ready to slide off any moment. His many legs, pitifully thin compared with the size of the rest of him, waved about helplessly as

minimum
milliliter
oOØ00
Jll1|
rn m rm nn
oec ftli

12/14pt

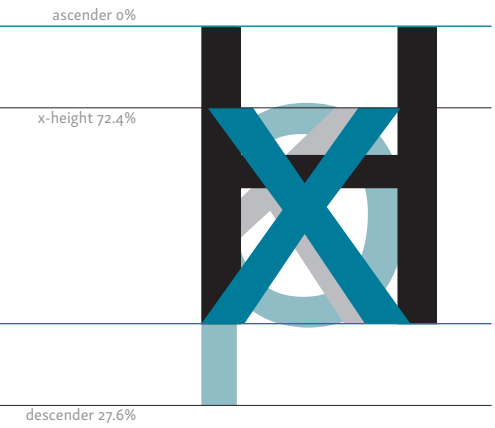
Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bed

minimum
milliliter
oOØ00
Jll1|
rn m rm nn
oec ftli

42pt

380 Car Illustrate Sugary

Vertical stroke terminations	tfjr
Horizontaly cut terminals and closed aperture	GJacs
Some glyphs with angled terminals	eg
Blunt corners on joins of diagonals	MNZz



Helvetica Neue

Reworked version of the 1957 neo-grotesque typeface by the Haas Type Foundry. Originally a display typeface of tight horizontal spacing, this design has found its way into interface typesetting by way of popularity of the Swiss style. The horizontal spacing, closed apertures and canon of similar shapes pose legibility problems, especially in small sizes.

Design:	Max Miedinger (Linotype)
Release:	1983
Application:	General purpose and display typesetting

24pt

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m
n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 ! & %

8/10pt

minimum
milliliter
oOØ00
JIl1|
rn m rm nn
oec ftli

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bedding was hardly able to cover it and seemed ready to slide off any moment. His many legs, pitifully thin compared with the size of the rest of him, waved about

12/14pt

minimum
milliliter
oOØ00
JIl1|
rn m rm nn
oec ftli

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42pt

127 Millenials Raffle Moe

BHNOR	Even capital widths
CGSacegs	Vertically cut terminals and closed aperture
EFH OCGQ oce	Highly similar shapes
27	Curvy diagonals in some numbers

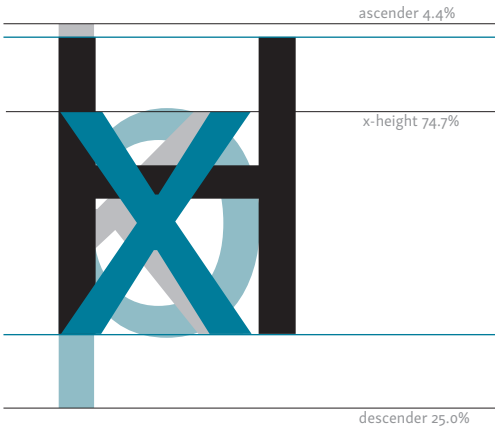
San Francisco (UI text)

A new typeface for the Mac Operating System with very strong neo-grotesque influences. Features optical sizes specifically design for small displays on handheld devices (not shown here). In comparison to Helvetica, some capitals are slightly narrower and some of the numbers are more straight-lined.

Design: Apple Inc.

Release: 2015

Application: Macintosh operating system



24pt

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m
n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 ! & %

8/10pt

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bedding was hardly able to cover it and seemed ready to slide off any moment. His many legs, pitifully thin compared with the size of the rest of him

minimum
milliliter
oOØ00
JIl1|
rn m rm nn
oec ftli

12/14pt

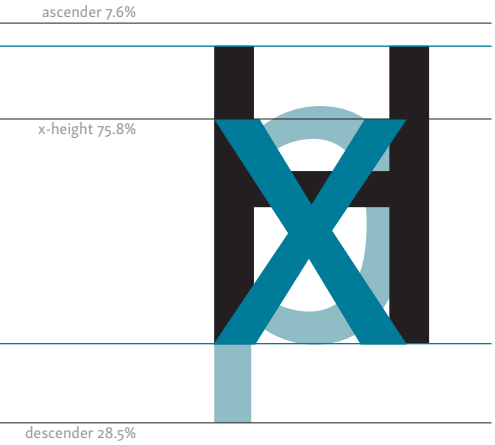
Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into

minimum
milliliter
oOØ00
JIl1|
rn m rm nn
oec ftli

42pt

174 Grand Rivalry Soft

Even capital widths	BHNOR
Vertically cut terminals and closed aperture	CGSacegs
Highly similar shapes	EFH OCGQ oce
Straight diagonals in some numbers	1247
Somewhat looser fitting than usual in neo-grotesques	nn
Corners expanded to prevent clogging	arnmhdbqp



Clear Sans

A typeface design with good legibility properties, especially from screen and in small sizes. Prominent features such as open counters, explicit glyph shapes and high x-height support legibility in small sizes. The angular round shapes, angular shoulders and overall even width give the face a strong and modernist character.

Design:	Daniel Ratighan (Monotype)
Release:	2013
Application:	Open source font for use at Intel's Open Source Technology center

24pt

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m
n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 ! & %

8/10pt

minimum
milliliter
oOØ00
JIl1|
rn m rm nn
oec ftli

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bedding was hardly able to cover it and seemed ready to slide off any moment. His many legs, pitifully thin compared with the size of the rest of him, waved about

12/14pt

minimum
milliliter
oOØ00
JIl1|
rn m rm nn
oec ftli

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections.

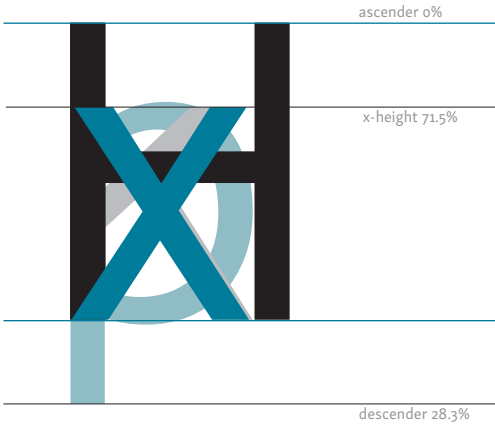
42pt

Apex Image Help Molder

onb	Round shapes with strong curve tension
nqg	Shoulder and bowls with diagonal angle
AP	Low verticals for good legibility in small sizes
JIl1	Distinct differentiation of confusable characters
HOBN	Capitals with modern proportions of even width
4Me	Attention to even colour on dense characters

InterFace

A raised x-height and slightly condensed make this typeface very suitable for interface typesetting. In heritage the design draws from humanist and grotesques influences. The lowercase has notably raised features within the baseline to x-height area.



Design: Bruno Maag (DaltonMaag)

Release: 2007

Application: General purpose

24pt

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m
n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 ! & %

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bedding was hardly able to cover it and seemed ready to slide off any moment. His many legs, pitifully thin compared with the size of the rest of him, waved about helplessly as he looked.

8/10pt

minimum
milliliter
oOØ00
Jll1|
rn m rm nn
oec ftli

12/14pt

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches

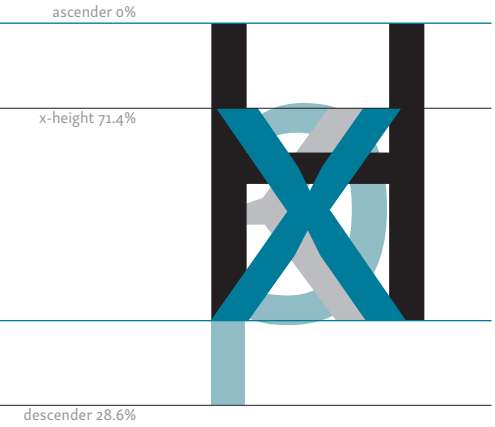
minimum
milliliter
oOØ00
Jll1|
rn m rm nn
oec ftli

42pt

Space Gorge Member Quell

Termianls cut at perpendicular angle
Big bowls and wide stem spacing
Lifted towards the x-height line
Short or no spurs
Humanist touch in some glyphs

CGSaces
bdpqnu
aek4
nmrpdbq
Qg&5



PT Sans

Designed with the intention of providing an extensive cyrillic charset, the typeface has gained popularity in web use through its warm character and good legibility stemming from its strong humanist roots.

Design: Aleksandra Korolkova (ParaType)

Release: 2009

Application: General purpose

24pt

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m
n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 ! & %

8/10pt

minimum
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JIl1|
rn m rm nn
oec ftli

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bedding was hardly able to cover it and seemed ready to slide off any moment. His many legs, pitifully thin compared with the size of the rest of him, waved about helplessly as he looked.

12/14pt

minimum
milliliter
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JIl1|
rn m rm nn
oec ftli

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bedding

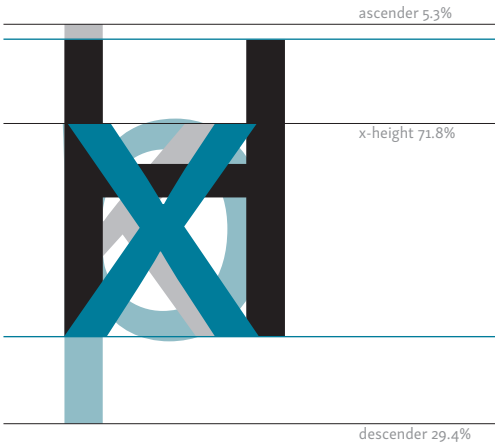
42pt

Quota Kids Implode Santa

onp — High curve tension
anp — Thinned spurs
acesCGS — Wide apertures and generous counters
kK4zZ — Angular cut ink traps
aQpqdb — Humanist influence

Myriad

A humanist sans serif design much in the vein of Frutiger (typeface) and Segoe UI, although with distinctly different italics. The typeface has found application in branding and identity design, but can be considered a general workhorse typeface of good legibility.



Design:	Robert Slimbach, Carol Twombly (Adobe Type)
Release:	1992
Application:	Adobe Reader, General purpose

24pt

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m
n o p q r s t u v w x y z
0 1 2 3 4 5 6 7 8 9 ! & %

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by arches into stiff sections. The bedding was hardly able to cover it and seemed ready to slide off any moment. His many legs, pitifully thin compared with the size of the rest of him, waved about helplessly as he looked.

8/10pt

minimum
milliliter
oOØ00
Jll1|
rn m rm nn
oec ftli

Grumpy wizards make toxic brew for the evil Queen and Jack. One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin. He lay on his armour-like back, and if he lifted his head a little he could see his brown belly, slightly domed and divided by

12/14pt

minimum
milliliter
oOØ00
Jll1|
rn m rm nn
oec ftli

42pt

Mystic Beckon Gated Quiz

Capital bowled characters with overshoot
Open aperture and terminal strokes cut at vertical angle
Distinctive curved tail
Splayed legs

BDRP
CScaesft
y
M

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Appendix III: Transcript of questionnaires

The following transcripts show the discussions with type designers that helped explore some of the more elusive aspects of interface typeface design. The questionnaires served to validate some of the assumptions about established conventions, but also inspired some aspects of the **Silta** design through the insight they provided. It is with great thanks to those professional type designers and for the benefit of other designers that those questionnaires are reproduced in this appendix. The choice of which designers to consult was based, in part, on the designs released by them and those typefaces' relevance to interface typography and screen legibility and readablity.

The questionnaires were conducted via email between May and July 2016. The reprinted transcripts focus on the relevant aspects of those emails only.

III a) Aleksandra Korolkova

JN: To start with, a few questions about your immensely popular design PT Sans and its origins. I understand one of the main objectives was to create a very comprehensive coverage of Cyrillic glyphs. At the same time, what comes to mind with PT Sans is a typeface that is highly popular all over the internet, stretching far beyond the Cyrillic writing cultures. How much was digital reading a focus for the design, and what design features would you attribute to this?

AK: *PT Sans's purpose was not only to support most Cyrillic-writing languages but mostly to cover as much needs as possible, and as it is a digital typeface we kept in mind screen reading as well as one of the important areas to use it. Perhaps for a screen-only typeface a slightly looser spacing would be better but for both screen and print it should be sort of universal. I think that the main feature that made PT Sans popular in the Web is its perfect TrueType hinting which was made manually by five experienced type technologists and which allows the typeface to look good on almost every screen.*

JN: One of the things I am interested in with typefaces that are used a lot in web interfaces is how much neutrality they need to embody, and how much character they can afford to have. The humanist shapes of PT Sans make it a pleasant to read typeface, and in terms of typefaces used to set digital interfaces in it's certainly on the warm and friendly end of the spectrum. Was there ever a point where you felt it was a design with too much character for such a universal claim (from paratype.com: "The main aim of the project is to give possibility to the peoples of Russia to read and write on their native languages.")? How, if at all, did this change or evolve throughout the design phase?

AK: *I think that today a more or less neutral sans-serif typeface which is intended to use for really long reading should be rather humanistic and friendly, it should sort of help the reader to move towards the endless lines of text. When I was designing the basic glyphs of PT Sans I kept in mind several most popular sans-serifs used for non-professional and semi-professional Cyrillic typography. They were: Arial (of course, as it was a default Windows font for a long time), and Calibri and Myriad which are closer to the humanistic end of the spectrum. So, as I'm not a great fan of Arial, I had almost no choice.*

JN: Another thing that puzzles me is legibility and letter shapes, and in particular, how similar letter groups of a typeface, like for example 'p' and 'q' look similar, without just being mirrored versions. The design of PT Sans, for example, is one such typeface I found that has such features.

Do you attribute this solely to the reference to a handwritten humanist skeleton behind the design, or was eliminating letter ambiguity a conscious intention? Should it be?

AK: *Of course it should — as I thought of more or less universal usage of PT Sans I just had to think also about the cases like road signs, dyslexia and others where the difference between similar glyphs is essential. I think when you are trying to design a workhorse typeface you should do it by default, it is worth the effort.*

JN: In terms of talking about type designs that serve a purpose or design case: Do you think there is such a thing as an "interface typeface", or are those typeface characteristics just incidental in they way they suit themselves to this particular application? What would you say makes a good "interface typeface", if this term makes any sense at all to you?

AK: *I think that there are some parameters which are more or less typical for an interface typeface — based on the medium. So, we need a typeface for screen and it leads to large x–height, open aperture, loose spacing and good screen performance (hinting or something like that, and maybe also a bit squarish letterforms). We have to use it for menus and dialogs, so 1) we may meet some words we've never met before, so the typeface should have easily recognisable glyphs and 2) we have to save the space so the typeface should be rather narrow than wide and have rather short than long ascenders and descenders.*

JN: To bridge over to slightly more practical and technical questions, let me ask about design considerations for screen rendering. Extensive hinting seems to become a thing of the past, and high density screen resolution like on smart phones and retina displays seem to be very widespread. With these low pixel restraints slowly becoming less important for type rendering on screens, do you think there still are things that are inherent to typefaces for this purpose? Are there design features that say: This is a typeface design for reading on screens?

AK: *I think all the same as for previous question, except the width. Also in case of high screen resolution we may switch to semi-closed aperture, like in San Francisco.*

JN: There is such a multitude of screens and rendering technologies that all affect how type renders on screen. A practical type design question: How do you test type rendering on different screens and configurations to verify the typeface renders as you intended?

AK: *It is not me who tests the rendering but they do it in different browsers and operating systems simultaneously. There is a specific testing utility which shows the same line of text in all sizes, allowing to switch rendering modes and emulate different browsers. Also, quite a lot of users, e.g. of different configurations of Linux, sent us their remarks and screenshots and some adjustments were made.*

III b) Tim Ahrens

JN: One of the first things I kept hearing over and over when getting into type design was to focus a design for typeface on a particular use case. As you acknowledge in your book on optical sizes, digital type is elusive when it comes to thinking about it in actual physical rendered size. How can anyone really say a particular design is (optimized) for screen reading, and what do you think that means today? If someone claims that a design is optimized for screen then this is mostly for marketing reasons. The optimisation takes place in the font production, i.e. hinting if you are thinking of Windows.

TA: *One thing we try to make sure is to have a good relation between regular and bold, i.e. enough difference. While on paper, a semibold can sometimes be clearly distinguishable from the regular, and suffice for emphasis, on screen we'd rather be on the safe side and provide a bold that is heavy enough to clearly look bold (bolder then the regular) on all screens. On the other hand, if it gets too heavy then the counters get smaller – again, something that may be acceptable in print if the exact conditions are known and predictable but difficult on screen where some rasterizers practically bolden the font. So, we try to find the sweet spot for the bold, which seems more important than for pure print fonts.*

Another thing we noticed is that on screen, many fonts have far too small a word space. This seems to be a fad, especially among inexpedience type designers. Of course, the texture looks more even if the word space is small, there are smaller "white holes" but it gets really difficult to pick up the words, especially if the general (letter-)spacing of the font is rather loose (another fad). Compare some contemporary fonts to Verdana, Georgia or Arial. The latter have huge word spaces, and I believe this is why still some say they are better to read than most webfonts.

JN: If we think, for example, about Microsoft's ClearType collection and purpose made designs like Calibri or Cambria for that rendering technology, what is the relationship between stylistic developments and technical fine-tuning? Is a typeface for "screen reading" merely a design that is informed by the possibilities and pitfalls of anti-aliasing, rendering engines and backlit screens, or, is there in fact something inherent in the design that comes from the screen medium?

TA: *I don't think there are any particular possibilities or pitfalls of anti-aliasing, it is simply a principle we apply to et the most out of the hardware at hand. I cannot see any features in Calibri or Cambria that make use of the then-new*

subpixel rendering. Only Candara with its slightly flared stems seems to be consciously using shapes that can best be expressed of the resolution in x-direction is increased.

JN: When you reflect on your own designs, for example Facit and the Bernini. Facit web, as I understand, is a fine tuned version to allow more details below the x-height

TA: *Yes, I reduced the extender lengths, especially the descenders. You could say this is like a size-specific optimisation but using short descenders is also something that I have come to do for most of my designs now, it has become a sort of personal style , etc, whereas Bernini is not an explicit screen font, but a hybrid, if you will?*

I think these days we can hardly afford to design for a particular technology. We have to be aware that the fonts we design in 2016 will be mostly read on screen, not paper, in their "lifetime" (which may be infinite, of course). On the other hand, we don't know much of future digital technology, hardware or software, or even reading and writing habits.

All we can do is to try to design good typefaces, which is more difficult than designing for a specific technology, which would give us some guidelines or even excuse if it does not look that great. Bernini is just that: An attempt to create a good type design.

JN: Do you design typefaces with a clear back-thought of making them work for both print and screen, does that come implicitly, or how would you describe your approach?

TA: *We do not design "for screen" or "for print" but using both for proofing certainly influences us in a way, partly unconsciously, that they work in both scenarios.*

JN: Over the short time of just about five years the typographic landscape on the web has changed dramatically. I am mostly referring to the technical possibilities of webfonts that allow designers more typographic options for designing content and interfaces – for better or for worse. Approximately in the same time, smart devices have truly become ubiquitous. Do we need new typefaces designed for these use cases, and what do they need to accommodate that is not manifested in existing designs?

TA: *Large and flexible families or even parametric solutions could help with any responsive typography. It is interesting to see that while responsive design has developed so rapidly over just a few years, font substitutions depending*

on the device/width are extremely rare. Maybe we will reach a point when website makers will do so and this could trigger font families that adapt to this need.

Another interesting question is that of sans or serif for reading on screen. Somehow, the really traditional text faces such as Garamond or Bembo feel a bit odd on screen, maybe because there will always be rectangular, technoid design elements visible, either on screen or at least the physical device and its contours. Maybe we can develop (serif) text fonts that do not feel strange when used in this context.

JN: It might be a non-existent distinction, but do you think type that is used in interfaces, like menus, buttons or icon labels has to have, or might benefit from, different characteristics, compared to type that is designed for more continuous screen reading?

TA: *Yes, definitely. For UI, large x–height usually is a benefit, or slightly condensed proportions, and maybe a slightly looser spacing. For continuous reading, especially on high-resolution screens, the opposite characteristics may be more comfortable.*

JN: One of the things that puzzles me a lot in regard to typefaces designed for use in operating systems is the question of neutrality and how much character such a typeface should lay claim to. On the one hand, there is designs like DaltonMaag's Ubuntu font which is almost futuristically quirky, and on the other hands designs like Roboto for Android seems to embody this almost prototypical, humanist, friendly neutrality.

TA: *Ubuntu vs Roboto is an interesting comparison. While both are somewhat un-neutral, they are so in very different ways. Ubuntu is applying a brand, a style to the whole OS, like dipping it into a sort of marinade. Roboto, despite its quirks, is some kind of anti-design, something that wants to reject the whole "style" issue, and is ultimately more successful in my opinion.*

JN: Apple launched their own San Fransisco in the vein of Swiss modernism, and Window's Segoe UI seems to, in my view, have a good touch of geometric sharpness. Is it a misconception to think interface type has to be inherently neutral to function, or are the mentioned examples just attempts at neutrality coming from different angles?

TA: *I like the notion of what Jonathan Hoefler called "hyper-functional" versus "hyper expressive" (see from 5:25 here* [http://www.aiga.org/video-pivot-2011-hoefler/]*).*

It is interesting to compare the concepts "neutral" and "functional". They are similar but different. You cannot go hyper-neutral, this just does not exist. You can, however, exaggerate functionality, like in Lucida or Verdana. Likewise, Meta or Fira are very functional but pleasantly not-neutral. I do not like Fira's vertical proportions, however: Making the capitals small can be a neat trick that is popular these days but it becomes ridiculous if the i-dot floats above the capitals, for example (on my Firefox phone, I saw this in "Tim" a lot, of course). Again, functionality over-done.

JN: To bridge over to slightly more practical and technical questions, let me ask about design considerations for screen rendering. Is extensive hinting a thing of the past, unless you want to support enterprise level outdated PC systems?

TA: *No, hinting is still important. Keep in mind that hinting is not just for the PC but also for printing and anything by Adobe.*

Many designers (even renowned foundries) do not even seem to test their fonts in Adobe/Acrobat Reader which, unlike Mac preview, does apply hints (PS as well as TT). I have seen really bad rendering in PDF specimens. I do manual PS-hinting for all our desktop fonts, it really makes a difference.

Still, TT produces even better results as you have much more control. So, for most of our webfonts we use TT-based fonts that are manually hinted.

JN: There is such a multitude of screens, pixel densities and rendering technologies that all affect how type renders on screen. So another practical type design question: How do you test type rendering on different screens and configurations to verify the typeface renders as you intended?

TA: *We do not really "test rendering" as there is not much you can do about it, except for hinting, of course, but this is not a matter of "testing" but simply working it out to get the result I want. What would you do if the font does not render well in some scenario where hinting is ignored? Change the design? There is no strategy for that, and it would not work universally. As I said above, working out a design with the specific intention to "render well on screen", by proofing on screen, making adjustments to improve it, this does not work although some font makers will claim they did so, for marketing purposes.*

JN: Do you actually preview your designs on a multitude of different screens and conditions?

TA: *Yes, but not for "proofing" or "testing". The iPad has a high resolution and is a handy device but it is very difficult to compare tow versions of a design since switching between PDFs or flipping pages without animation is nearly impossible. I use Acrobat Reader on my retina iMac a lot since it allows me to compare fonts by toggling (Cmd+` is my best friend!). Not even paper allows for this kind of switching.*

JN: And my final question, in the light of all discussed before: Is there such a thing as an "interface typeface", or is that merely a use case?

TA: *I think my comments on fonts for UI answer that.*

III c) Lukas Paltram

JN: In terms of characteristics of a typeface design, where would you draw the distinction between screen reading, interface typography, and signage?

LP: From a typeface design perspective I would draw the following differences:

screen reading - a typeface designed for screen reading needs to be designed for long reading on a specific target device, or a wide range of screens/ devices, depending on the brief. Generally it is important that the quality, resolution and rendering approach of the screens are taken into account. How a "screen reading font" will look will always depend on the kind of screen you're targeting. Historically it was easier to draw a distinction between what is appropriate for a screen and what is appropriate for print, but today it is much harder to draw a distinction between the two, as screens get better and better, and more and more reading happens on screen. If you're designing a reading font for screens with lower or standard resolution, I would say the following applies: the shapes need to be strong enough, have low contrast, evenly balanced spacing, decisive design features, relatively large x–height, I don't see much restriction on width. The fonts should be generally be hinted, so optimised for screen. The general rules of legibility and readability apply for typefaces that are designed for screen as much as they do for print.

interface typography - a typeface designed for user interfaces serves a different purpose to the above. It is not important that the typeface is performing well in long text, but it has to be absolutely and totally clear in short pieces of text such as menu titles. Every letter in the typeface should be clearly distinguishable, as you have to plan for obscure words, passwords, code, domain title etc. You need to be able to distinguish similar looking letters, such as i, l, I, 1, |, etc. Shapes should be clear and distinctive and decisive. Since the typeface will be mainly used in small and text sizes, the letter-shapes should adhere to general standards of legibility in small size, such as open counters, open terminals, definite proportions, relatively large x–height, balanced spacing, etc. There could be additional requirements for interface designs, that have to do with the restricted space that is available in a user interface environment. So it could be needed to keep ascender and descender proportions compact, as well as horizontal proportions, considering economy of space. It is very important to consider language support and the effect of diacritics, accents on the Latin proportions, as well as the relation to non-Latin script systems if required. Generally interface fonts for digital environments should be hinted, but again it depends on the actual target platform. Ubuntu was a an example of a user interface font that we have designed.

signage - there are different requirements for typefaces that are used in wayfinding, street signage, traffic signage, etc. Generally the physical space is to be taken into consideration. What are the physical environments in which the signage typeface will be applied. An airport is different to a supermarket is different to a hospital or a street in a town, and there might be different restrictions of space, reading distance, light environment etc. All of which could influence the design of the typeface as well as the typesetting. Generally I would say that slightly condensed structure has major benefits for space saving. Again, a clear design, large x–height, open counters, comfortable stem weight are very important. Letter shapes should not be ambiguous and easily recognisable at distance. Stroudley is an example from our library with signage in mind.

JN: Is there a category of "interface typefaces", or is that merely a use case?

LP: *I would say that a digital user interface has very specific requirements for a font, so I would say it is a category yes.*

JN: It is particularly great to be able to query the designer intimately familiar with the Ubuntu typeface. In my reference material of interface typefaces Ubuntu seems to be on the idiosyncratic end of the spectrum, in terms of tone and details (thinking of the diagonals, f and t bar, shoulders ending into the end of the stem).

How much was this influenced by the brief, and was the question of neutrality and how to weigh it something that came up a lot during the design discussion?

What were some of the other considerations guiding this design that might not immediately be obvious?

LP: *Designing the Ubuntu was indeed a great challenge as the relaunch of the new GUI and new brand elements, new logos of Canonical and Ubuntu all came together at the same time with the font as the major communication tool. Generally it was always clear that the font would be designed for the user interface of the operating system, so that was the absolute primary focus, but it had to carry a certain brand message as well. It had to be clear to the reader/user by looking at the typeface that they are in the Ubuntu environment. There was an ambition to be able to distinguish the font from other operating system fonts, and that was very much in line with the thinking of how the general UI was designed, all the menus, colours, icons, etc. So it was a great opportunity to have a completely aligned approach, and that worked very well in my opinion. Here is a little article* [http://design.canonical.com/2010/08/finding-the-ubuntu-font-design/] *were I talk about the first steps of the design, it is quite old by now, but still relevant. And the*

font has evolved quite a bit since then. I still think that the Ubuntu font is a successful example of creating a interface font that can carry some personality, which almost sounds like a contraticti on in itself. But some decisions, like simplifing the n to an extreme, or shortening the t bar, were all done with functionality and legibility in small sizes in mind, These changes actually don't affect legibility in a negative way, but in larger size they are very distinctive, and the whole deisgn approach was scalable and expandable to other weights and script systems. (the blog that I linked to has more articles from the time of the development of the typeface)

JN: In more general terms, do you think interfaces and their typography should be neutral? (And what is neutrality for interfaces, compared to, say, neutrality for a book face?)

LP: *I don't think that neutrality is always the main aspect. Clarity is, functionality is, but not necessarily neutrality. In fact, it might be beneficial to be able to differentiate different interfaces from each other, if the fonts that are used are different.*

JN: A "layman" commentator of my thesis research and own type design asked me if there was anything "built into" the design of the typeface that could make it more suitable or easier to be used in interfaces. Is there some prototypical quality to interface design that informs the design of a typeface crafted for that very purpose?

LP: *I think I mentioned most of the qualities that a successful interface typeface needs to include. Functionality is the primary focus. Being able to clearly distinguish and identify information. There is no trick, no single feature that allows that, it's a combination of parameters.*

JN: To finish off on a more practical note, what is your process for screen testing typefaces, when today we have a multitude of renderers, physical screen sizes and pixel densities?

LP: *Our general approach is to test in extreme scenarios. It is nowadays impossible to test on all screens, devices, rasterizers, etc. but if you're able to test in extreme cases and resolve those, and work with industry standards and conventions, you should be confident that the fonts will display in all the multitude of devices and screens in between.*

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