Ergonomics In Design, Vol. 77, 2023, 110–121
https://doi.org/10.54941/ahfe1003368

Research of the Typography Design for Digital Reading on Mobile Devices

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ABSTRACT

Typography is the art and technique of arranging typeface and space to make written language legible, readable and appealing when displayed. Typography can be traced back to humans consciously arranging elements, such as text and graphics, on a plane according to specific rules to convey a message effectively. Typography requires that the content be normative, readable, and aesthetically pleasing, which can effectively help improve the reading speed, optimize the efficiency of information transmission, and enhance the audience's visual perception. Digital media has changed how we access and communicate information. Digital reading is becoming our dominant mode of reading. Compared with traditional media, digital reading offers convenience, immediacy, and interactivity. From the Xerox Alto, the first system to have all of the contemporary Graphical User Interface (GUI) components, to the current apple iOS16 system, based on breakthroughs in science and technology, significant changes have occurred in interface functions and appearance. However, simultaneously, the content information carrier screen must stay within the rules of typography and follow the rules of standardization, readability, and aesthetics. This article focuses on the mobile base screen through the research of grid system, font and image of the existing interface design system, summarizes the fundamental purposes of typography which is to adapt to changes in reading scenarios, effectively convey information, and standardize typography for mobile applications for digital reading.

Keywords: Typography, Digital reading, User experience, Layout

TYPOGRAPHY DESIGN

The Definition of Typography Design

"Typography is a process, a refined craft making language visible" (Cullen, 2012). It involves choosing fonts, point sizes, line lengths, leading, tracking, kerning, margin, picture arranging, and color for different kinds of content through various mediums. Typography is an essential aspect of design. It is not simply the placement and composition of words and pictures but also plays a role in the readability and effectiveness of content, which is often used to set the tone and voice of a body of text and can influence the way that readers perceive content. Typography designers often define their roles as both artists and communicators. As artists, they are responsible for creating visually appealing designs that capture the reader's attention and convey the desired aesthetic. As communicators, they are responsible for ensuring

that the text is legible and easy to read and for using typography to convey meaning and message effectively.

The Development of Typography Design

The history of typography can be traced back to prehistoric civilizations when early humans arranged pictographic symbols on rocks. Early forms of typography were created using various materials, from mud boards, papyrus, bamboo and wooden slips to papers. Gutenberg's invention of the printing press in the 15th century marked a significant turning point in the history of typography, as it made it possible to mass produce printed materials quickly and efficiently. The invention of the printing press also paved the way for the development of a standardized system of fonts, which helped to ensure that printed materials were legible and consistent. The Industrial Revolution, which took place in the 18th and 19th centuries, changed typographic communication's social and economic role (Meggs & Purvis, 2016a). From the Arts and Crafts Movement to the Art Nouveau Movement, significant changes have taken place in typography design to solve the rigid characteristics of machine production.

In the 20th century, the Bauhaus movement promoted the concept of functionality in design and emphasized the unity of art and technology. The images of science, rationality, and order were applied to all design aspects. During this period, artists attached great importance to simple and rational design, which enabled the typography of the Bauhaus style to convey design information effectively. Bauhaus artists created typefaces composed of curved and straight lines based on the non-decorative lines of the 19th century. They also explored using abstract geometric shapes and photography as graphic illustrations in typography. The design concept at this time was that function determined form, with market elements and human needs as the basis for design (Alexandra, 2016).

In late modernism, the rationalization of layout design was further refined, and grid techniques were used in typography to divide the layout rationally. Swiss designers studied the application of grid systems in graphic design, and this design method continued to be used in the typography of newspapers and magazines.

These developments in typography have had a lasting impact on the field of design and continue to shape the way text and images are arranged in modern typography design.

The Principles of Typography Design

Typography design is an important communication element and crucial in conveying information and ideas through text. Effective typography design involves creating legible, visually appealing designs that effectively communicate the desired message to the audience. To develop effective typography designs, designers must consider various factors, including font, color, size, weight, spacing, and other design elements.

Legibility is a crucial principle of typography design, which means considering the text based on different devices and screen sizes, and using an

appropriate font, color, font size, font weight, lettering, and spacing to make the contents easy to read (Landa, 2018).

Creating a hierarchy of information is also essential, which can be done by highlighting the critical information, distinguishing between primary and secondary information, and designing the layout according to the size and relationship order of the visual image of the primary and secondary information (Keyes, 1993).

Unifying the form and content is another principle in typography design, as the perfect form should always be in line with the theme of the texts.

Lastly, consistency is the principle by which consistent color scheme, font, and layout is used throughout the design. This helps to create a cohesive style and makes the whole content easier to read and navigate.

DIGITAL READING

The Definition of Digital Reading

"Digital reading refers to the digitalization of reading materials and the digitalization of the reading process itself" (Bigelow & Day, 1983). The digitalization of reading materials refers to converting traditional reading materials, such as books, magazines, and newspapers, into digital formats, such as e-books, digital magazines, and online articles. This allows readers to access these materials on various digital platforms, including e-book readers, tablets, and computers.

The digitalization of reading methods refers to using digital technologies to facilitate the reading process. This includes features such as adjustable text size and font, the ability to take notes and highlight text, the option to search for specific words or phrases within a text, and the function to write comments or share with other people. Digital reading methods also allow for a more interactive and personalized reading experience, as readers can customize their reading experience to meet their individual needs and preferences.

The Current Digital Reading Situation

Many traditional print materials, such as books, magazines, and newspapers, have been digitized and are now available in electronic formats. Various digital reading platforms, such as e-book readers, tablets, and smartphones, have emerged to make accessing these materials easier. According to the 2020 China Digital Reading Report from the China Audio Video and Digital Publishing Association, as of December 2020, the scale of China's digital reading industry reached 35.16 billion yuan in 2020, and the number of digital reading users reached 494 million. The per capita e-book reading volume was 9.1, and the per capita audiobook reading volume was 6.3. At the same time, the per capita reading of paper books was 6.2, 2.6 fewer than last year. Users' average single e-reading time is 79.3 minutes (Lin, 2021).

The Characteristics of Digital Reading

Convenience

Digital texts can be accessed and downloaded from many platforms, at any time, and can be stored on a device or in the cloud for easy access. This makes them more portable than traditional print materials. This allows readers to access their reading materials wherever they are. Furthermore, digital reading materials take up much less physical space than traditional print materials, providing the advantage of minimizing storage requirement.

Immediacy

Compared to traditional reading, where a physical book must be obtained, digital access allow readers to obtain a wide variety of books and articles from any location with an internet connection. In addition to accessing online information, the immediacy of digital reading also allows readers to start reading a new book or article as soon as they purchase or download it. This is particularly useful for accessing up-to-date information, as it means that readers can obtain the latest news and information as soon as it becomes available, rather than having to wait for a print edition to be published.

Interaction

Digital reading allows for a more interactive and personalized experience. Text size and font-adjusting functions can assist people with visual impairments and other reading difficulties. Note-taking and highlighting functions can help readers understand and remember the material better. The search function can assist readers find detailed information. Hyperlinks allows easy access to resources or multimedia content, which can provide a more interactive and engaging reading experience.

Responsive design

Digital reading materials are often accessed on different devices, including smartphones, tablets, and computers, each with different screen size and resolution. This has led to the development of responsive design techniques, which allow the text to adapt to the size and shape of the screen to maintain legibility and visual appeal.

Content Types of Digital Reading

- **News articles**

Digitalized news articles are usually published on websites or through online news platforms. Digitalized news articles may also include multimedia elements, such as videos, photos, and interactive graphics, enhancing the reader's experience and providing a more immersive and engaging way to consume the news.

- **Books**

E-books or electronic books have been converted into a digital format and can be accessed and read on electronic devices, such as computers, tablets,

and e-readers. E-books are typically downloaded from online bookstores or libraries and can be read on various devices using specialized e-book reading software.

- **Magazines**

Many magazines offer digital versions of their content in addition to their print editions. These digital versions of magazines sometimes called "e-magazines" or "digital editions," are often available through subscription services or as individual purchases.

- **Blog and social media posts**

Blog and Social media platforms such as Twitter, Pocket, Facebook, and WeChat allow users to read and interact with written content in a digital format. Many of include features that make it easy for users to share articles, blog posts, and other types of written content with their followers or friends. These platforms often include commenting and discussion features that allow users to interact with the content and each other.

TYPOGRAPHY DESIGN ON MOBILE DEVICES

Definition of the Typography Design on Mobile Devices

Typography design on mobile devices is how text is displayed and formatted. On mobile devices, typography design is often focused on ensuring that content is easy to read on the small screens of these devices. This may involve using larger font sizes, adjusting the line spacing, and using fonts that can be easily read on small screens. Mobile devices also often have specific typography design considerations due to their use of touch screens. For example, the size and placement of buttons and other interactive elements should be designed with typography to ensure that they are easy to tap with a finger.

The History of Typography Design on Mobile Devices

The history of typography design on mobile devices is closely tied to the user interface (UI) design development. UI design focuses on creating functional, user-friendly interfaces allowing users to navigate and interact with the device effectively. Good typography makes the act of reading effortless and enjoyable, which can improve the user experience and increase user engagement (Watzman, 2003).

Digital technology has radically influenced typography design since the early 1980s. One of the key developments in this period was the emergence of portable computers and other portable electronic devices, such as the Psion Organizer, one of the first portable computers to be marketed as a personal digital assistant (PDA). The Psion EPOC operating system was popularized in various devices in the early 1990s, powering many of the early personal digital assistants and enabling more complex applications, including word processors and spreadsheets. The Palm Pilot PDA, released in 1996, profoundly impacted features such as touch screens and data synchronization

in modern smartphones (Tilson & Lyytinen 2011). In 2007, Steve Jobs permanently changed the rules for mobile application designers and developers (Meggs & Purvis, 2016b). In 2010, Microsoft entered Android's competition with Apple with a flatter mobile operating system. Microsoft's design emphasized clean typography, flat planes, and bright colors and contrasted with the digital approximation of real-world textures popular at the time. That same year, the iPad was created to help pioneer responsive design. Apps needed to adapt to a wider range of screen sizes, not only for mobile apps but also for websites (Gardner, 2011). In 2014, Google combined skeuomorphism and flat design to create Material Design. Material Design presents a coherent digital material language that is an element native to application design. With the introduction of mobile app design to the Apple Watch and Android Wear in 2014, the tiny screen space meant adapting to some new mobile app design norms.

The Characteristics of Digital Reading on Mobile Devices

Compared to digital reading on laptops or tablets, digital reading on mobile devices has influenced typography design further, changing how text is displayed and consumed. Some ways digital reading has influenced typography design include:

- **Small size and low-resolution**

One of the most apparent differences is the screen size. Laptops or tablets typically have larger screens than mobile devices, making them more suitable for reading longer articles or books. On the other hand, mobile devices have smaller screens that may be more suited to shorter, more concise content. To overcome this problem, digital reading technologies have to provide more flexibility in text formatting and layout, whereby designers adjust the size and font of the text, as well as the spacing and alignment, to create legible and easy-to-read text.

- **Better portability**

Mobile devices are designed to be portable and easy to carry; they are often used in various locations and under a wide range of lighting conditions. This has led to the development of typography design techniques to allow reading in different lighting conditions and on different types of screens. Another way that portability has influenced typography design is by using high-contrast text. Mobile devices are often used in bright sunlight or other high-contrast lighting conditions, making it difficult to read text on the screen. To improve readability in these conditions, typography design for mobile devices often focuses on using high-contrast text colors and backgrounds to ensure that text is easily visible.

- **Different interaction modes**

Mobile devices often include touch screens and other interactive features that allow users to interact with the device differently. On the other hand, laptops typically have a keyboard and mouse as the primary input methods.

The Principles of Typography Design on Mobile Devices

iOS and Android are currently the two dominant operating systems for mobile devices, and they are used on a wide range of devices. Research on the typography design for these operating systems is likely relevant to many users and devices. Both iOS and Android systems have guidelines for interface design. These guidelines help ensure that interfaces are visually appealing and easy to use. iOS has a set of Human Interface Guidelines (HIG) that provide recommendations for designing interfaces for iOS devices. These guidelines include detailed typography, colour, and layout. Android also has guidelines for interface design, known as Material Design guidelines. These guidelines include recommendations for margins and spacing and other design elements such as typography, colour, motion, and icon.

Grid System

The grid system is a layout structure used to organize content consistently and predictably. It involves dividing a design space into a series of horizontal and vertical lines, creating a series of rows and columns that can position and align elements within the design. In typography design on mobile devices, a grid system can be used to create a structured layout for the text, helping to ensure that the content is easy to read.

According to Material Design 2 (Google, 2018), which Google released on November 21, 2018, the responsive layout grid comprises of three elements: columns, gutters, and margins.[5] Columns are the vertical areas of the screen that contain content, and they are used to structure the layout and create a grid-like structure for the content. The number of columns is usually even, such as 2, 4, or 6, and designers can choose the number of columns based on the needs of the layout and the content being presented. For example, a design with more columns might be used for more complex or structured content, while a layout with fewer columns might be used for more simple content.

Gutters are the spaces between columns that help separate and distinguish different content areas. The standard size for the gutter is 20px, 24px, 30px, and 40px, and the minimum is no less than 16px. The spacing should not be too large. If the gutters are too large, the visual flow of the layout can become confusing, and the interface can appear loose or disorganized. On the other hand, if the gutters are too small, the content can become congested and difficult to read, and users may feel visual tension when viewing the layout.

Margins are the spaces between content and the screen's left and right edges, and the area inside the margin is called the safe area. They are used to create white space around the edges of the screen and between different elements within the interface. Margins can also help to make text and other elements on the screen more legible by providing enough space for them to "breathe" and not feel cramped. The size of margins can vary, but standard sizes include 32px, 30px, 24px, and no less than 20px. Larger sizes may be used on larger screens to create a sense of balance and visual hierarchy, while smaller sizes may be used on smaller screens to conserve space.

The layout grid system for mobile devices should be designed to be responsive to the screen size so that the content is displayed in an organized and readable way, regardless of the device used to view it.

Font

The font for digital reading avoids expressive or decorative fonts for body text because these can be harder to read at small sizes. Thus, sans-serif fonts are often used on mobile devices because they tend to be more legible on small screens and can also help reduce visual clutter. The specific font choices made by Android and iOS systems largely depend on design preference and branding.

The default font for Android is Roboto, which has been used as the system font for Android since version 4.0 (Ice Cream Sandwich), released in 2011. Roboto is a sans-serif font designed specifically for mobile devices, and it is intended to be highly legible and easy to read on small screens. It has a modern, geometric design with a slightly condensed form that helps save screen space. Roboto has become famous for designers and developers working on Android apps ().

San Francisco is a sans serif font family that includes the SF Pro, SF Compact, SF Arabic, SF Pro Rounded, and SF Mono variants designed by Apple Inc. specifically for use as the system font in iOS, macOS, and watchOS. It was first introduced in 2015 with iOS 9 and OS X El Capitan. Before that, Apple had used the Helvetica family of fonts as the default system font for all its operating systems. Compared to Helvetica, San Francisco has a larger x-height (the distance from the baseline to the midline of a lowercase letter) and wider letterforms, which makes it easier to read on small screens. This was designed for better readability on smaller displays, like the Apple Watch (Apple, n.d.).

Other than the default font, Android and iOS system have many custom typefaces that it has designed for use in their operating systems and other products, including Gilroy, Myriad, Lucida Grande, Noto, and Droid. iOS also includes New York (NY), a serif typeface family designed to work well by itself and alongside the SF fonts. For other languages, iOS includes several system fonts for use with specific languages, such as the Heiti font family for Chinese, the Hiragino font family for Japanese, and the Geeza font family for Arabic. Android includes similar fonts for different languages, such as Noto for many scripts and languages and Roboto for Latin-based scripts.

Size and Leading

The operating system determines the default font size for Android and iOS devices and can be adjusted by the user in the device's settings. Usually, there are seven level options of font size, ranging from small to medium to large. Users can adjust the font size to their preference using a slider or a set of predefined size options in the device's "Display" settings. On Android devices, the default font size is typically set to "Medium," which is around 16 pixels, as well as on iOS devices.

In addition to the general font size settings, the font sizes of different text types are also specified. The CSS (Cascading Style Sheets) code method is a

standard used in web page design to set font sizes for different text types, such as headline, titles, body, caption.

For example, the Material Design guidelines for Android recommend using a scale ranging from 18pt to 24pt for headlines and a range of 12pt to 16pt for body text. The iOS Human Interface Guidelines recommend using a range of 17pt to 34pt for headings and a base size of 17pt for body text, with smaller sizes from 11pt to 13pt used for captions and footnotes. These ranges are provided as guidelines, and designers and developers can choose specific font sizes within these ranges to suit the needs of their design.

The amount of space between lines of text, known as leading, helps to improve readability by creating a visual "breathing room" between lines of text. It can also be specified as a unitless value, which is a multiple of the font size. For example, a line height of 1.5 would be equivalent to 1.5 times the font size, while a line height of 2 would be equivalent to 2 times the font size.

Color

The color system handles the variability of dynamically changing color schemes that arise as user inputs change, and it provides a foundation for flexible color application. The color system typically includes primary, secondary, tertiary, neutral, and error colors, which can create cohesive and harmonious color schemes that support the overall design goals and objectives.

The primary key color is used to derive roles for key components across the UI, such as the FAB (floating action button), prominent buttons, active states, and the tint of elevated surfaces. The secondary key color is used for less prominent components in the UI, such as filter chips while expanding the opportunity for color expression. The tertiary key color is used to derive the roles of contrasting accents that can be used to balance primary and secondary colors or bring heightened attention to an element. The tertiary color role is left for teams to use at their discretion and is intended to support broader color expression in products. The neutral key color is used to derive the roles of surface and background, as well as high-emphasis text and icons. The error color is usually used to highlight error information, such as when an input is invalid or an issue with the system. The color scheme can help create a cohesive and harmonious visual design that supports the overall design goals and objectives. It can also create a visual hierarchy by using different colors to highlight other elements and create emphasis and contrast.

In addition to the color system, the option for dark and light modes is often available on mobile devices to adjust the display's appearance. The dark mode is a setting that inverts the display's colors, making the background dark and the text and other elements light. This can be easier on the eyes in low light conditions and can help extend battery life on devices with OLED screens. Light mode is the opposite of dark mode, which displays the display's colors in their normal, light-colored form. Light mode is generally easier to read in well-lit conditions and is often the default setting for mobile devices. Depending on the specific circumstances, dark and light modes can be helpful for digital reading on mobile devices. Some mobile devices allow users to manually switch between dark and light modes, while others may automatically switch between the two modes based on ambient lighting conditions.

Images and Videos

Pictures and videos should be placed to complement the text and enhance the overall reading experience. When placing pictures and videos in a layout, designers should consider the size, resolution, and placement of the media elements to ensure that they fit well within the design and do not disrupt the reading experience. It is also important to consider the balance and hierarchy of the layout and to ensure that the media elements are used to support and enhance the overall design rather than overwhelming it. Furthermore, pictures and videos are interactive; for example, the pictures can be zoomed in to see the details, and videos can be played directly on the page.

Icons

Icons can be used in typography design to help convey information quickly and clearly. They can be used to represent specific actions, such as a trash can icon for deleting content or a gear icon for adjusting settings. Icons can also illustrate concepts or ideas, such as a heart icon indicating love or a light bulb icon indicating an idea. In typography design, icons can supplement the text and provide visual interest and clarity to the layout. They can help to break up large blocks of text and make the content more visually appealing and easier to scan.

Icons should be designed with simplicity to ensure that they are easily recognizable and can be understood quickly. This involves using simple shapes, bold lines, and limited colors to create a clear and concise visual representation of the concept or action that the icon represents. In typography design, using simple and recognizable icons can help improve the layout's usability and clarity, mainly when used in conjunction with the text. By using icons to supplement the text, designers can create more visually appealing and user-friendly layouts that are easier for readers to understand and navigate.

Typography Design of Content Types

Newspaper

Published newspapers often layout several articles on the same page using columns, allowing readers to browse and scan through different pieces of content quickly. In contrast, digital newspaper on mobile devices typically uses a more streamlined layout focusing on a single article at a time, with links or buttons allowing users to navigate to other articles. This can make the layout of newspaper apps feel more focused and easier to read, but it may require users to do more scrolling or clicking to access all of the content. Thus, typography design for news articles on mobile devices should focus on creating a straightforward and enjoyable reading experience for the user.

Both digitalized newspapers and magazines use many interactive elements, such as hyperlinks and multimedia. Digital magazines or news apps often include links to additional content and interactive features such as videos and audio, which are impossible in printed magazines.

Books and Magazine

Books and magazines have remarkable similarities in content structure and typography design. Traditional magazines and books are arranged from top

to bottom in the order of contents. In the digital version, the content is usually accessed through links and can be easily navigated to the desired section.

One of the main differences between the digital and the traditional printed versions is the grid system's use. In digital books and magazines, designers typically use fewer columns to create a more fluid and flexible layout, which allows designers to better take advantage of the interactive features of digital magazines, such as links and multimedia content.

Blog and Social Media

In social media and blog platforms, the layout design often focuses on simplicity and ease of reading. This is because these platforms are meant for immediate content consumption and are usually accessed on mobile devices with smaller screens. The layout design usually consists of a single column of text with images interspersed throughout to break up the text and add visual interest. Headings and subheadings are used to create hierarchy and structure within the text, and bullet points and numbered lists are often used to make the text more easily scannable.

CONCLUSION

Appropriate typography design is vital in creating a clear and easy-to-use mobile interface. By carefully designing the font, size, components, controls, and other interface elements, designers can create a cohesive and visually appealing layout that is easy to read and navigate. Using a standardized and modular interface style can also help to create a clear and consistent design, making it easier for users to understand the content and navigate the interface. This can help to reduce cognitive load and improve the overall user experience. Using fonts suitable for screen display and following the rigorous, long-term tested data for font size, length, spacing, and other interface elements can help enhance the sense of hierarchy and improve the overall user experience. By considering these factors, designers can create typography designs that are more readable and legible, making it easier for users to find and understand relevant interface elements. This can help enhance the user experience's overall pleasure and make the interface more enjoyable.

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