Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Information Technologies

Bachelor Thesis

The Psychological and Health Dynamics of Digital Design on User Engagement

Ahmed Soliman

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

BACHELOR THESIS ASSIGNMENT

Ahmed Soliman

Informatics

Thesis title

The Psychological and Health Dynamics of Digital Design on User Engagement

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Objectives of thesis

The main objective is to investigate the comprehensive impact of website design, integrating psychological principles such as color psychology, visual hierarchy, and emotional design, alongside health considerations, on user experience and engagement. Additionally, it aims to understand how these factors can influence the success of companies that primarily rely on their websites for business activities, as well as digital government services, important apps, and so on.

- Explore the interplay between psychological and health dynamics in digital design, elucidating how these factors influence user perceptions, emotions, and physiological responses.
- Evaluate the effects of digital design on the effectiveness and success of companies, digital government services, Apps etc..: Assess the impact of psychological and medical factors on metrics such as user retention, task completion rates, and user satisfaction scores.

Methodology

The theoretical framework of this thesis will be established through an extensive review of scholarly articles, books, industry reports, and relevant online resources related to website design, color psychology, visual hierarchy, emotional design, and their impacts on user behavior.

The empirical research will employ a mixed-method approach, incorporating both quantitative and qualitative methodologies. Quantitative data will be collected through surveys administered to users from diverse demographic backgrounds to assess their perceptions, attitudes, and engagement with webpage design elements. Qualitative data will be gathered through in-depth interviews with web designers and users to explore their experiences, preferences, and insights related to webpage design.

The findings from the literature review and empirical research will be synthesized to draw conclusions and formulate recommendations for optimizing webpage design to enhance user engagement and satisfaction, along with suggestions for future research directions in this area.

The proposed extent of the thesis

40-50 pages

Keywords

Website Design, Color Psychology, Interaction Design, Emotional Design, User Engagement, Psychological Impacts, User Experience (UX), Medical Dynamics, Information Technology

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Recommended information sources

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The Bachelor Thesis Supervisor

Ing. Martin Lukáš, Ph.D.

Supervising department

Department of Information Technologies

Electronic approval: 09. 07. 2024

doc. Ing. Jiří Vaněk, Ph.D.

Head of department

Electronic approval: 04. 11. 2024

doc. Ing. Tomáš Šubrt, Ph.D.

Dean

Prague on 17. 02. 2025

Declaration

I declare that I have worked on my bachelor thesis titled " The Psychological and Health Dynamics of Digital Design on User Engagement " by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break any copyrights.

In Prague on 15.01.2025 

Acknowledgement

I would like to extend my gratitude and appreciation to Professor Ing. Martin Lukáš, Ph.D., and Ing. Adéla Hamplová, Ph.D., for their support and guidance during the process of writing my thesis. I would also like to thank my family for their support and encouragement throughout my studies and the thesis writing process.

The Psychological and Health Dynamics of Digital Design on User Engagement

Abstract

This thesis delves into the fascinating intersection of psychology, health, and digital design, examining how well-crafted interfaces can shape user engagement and satisfaction. Using government services as a key example—specifically parking systems in the Czech Republic and Estonia—the study explores the profound impact of design elements such as ease of use, color psychology, visual hierarchy, and inclusivity on user experience.

Employing a mixed-method approach, the research combines surveys with system users and interviews with web designers and regular users to provide a comprehensive analysis. The findings reveal a stark contrast between the two systems: Estonia's parking system stands out for its simplicity, transparency, and accessibility, while the Czech system struggles with complexity, limited inclusivity, and a lack of clarity.

By emphasizing the importance of user-centric design, this thesis offers actionable recommendations for improving not only parking systems but also other digital government services. These insights demonstrate how thoughtful design can transform public digital platforms into efficient, inclusive, and engaging tools for users.

Keywords: Website Design, Color Psychology, Interaction Design, Emotional Design, User Engagement, Psychological Impacts, User Experience (UX), Medical Dynamics.

Psychologická a zdravotní dynamika digitálního designu na zapojení uživatelů

Abstrakt

Tato bakalářská práce se zabývá fascinující oblastí průniku psychologie, zdraví a digitálního designu, a zkoumá, jak mohou dobře navržená uživatelská rozhraní ovlivnit zapojení a spokojenost uživatelů. Jako hlavní příklad využívá vládní služby, konkrétně systémy parkování v České republice a Estonsku, a zkoumá vliv prvků designu, jako je snadnost použití, psychologie barev, vizuální hierarchie a inkluzivita, na uživatelskou zkušenost.

Výzkum používá smíšený metodologický přístup, který kombinuje dotazníková šetření mezi uživateli systémů a rozhovory s webovými designéry a běžnými uživateli, aby poskytl komplexní analýzu. Výsledky odhalují významné rozdíly mezi oběma systémy: estonský systém vyniká svou jednoduchostí, transparentností a přístupností, zatímco český systém se potýká s komplikovaností, omezenou inkluzivitou a nedostatečnou přehledností.

Práce zdůrazňuje důležitost uživatelsky orientovaného designu a nabízí praktická doporučení pro zlepšení nejen parkovacích systémů, ale také dalších digitálních vládních služeb. Získané poznatky ukazují, jak může promyšlený design proměnit veřejné digitální platformy v efektivní, inkluzivní a poutavé nástroje pro uživatele.

Klíčová slova: Webový design, psychologie barev, interakční design, emocionální design, zapojení uživatelů, psychologické dopady, uživatelská zkušenost (UX), zdravotní dynamika.

Table of content

1 Introduction

Background of the Study

Beyond Aesthetics: The Fundamental Role of Digital Design

In today's digital world, website and app design has become essential in shaping user engagement and determining user satisfaction. Digital design, which includes layout, color schemes, typography, and interactive elements, influences how users experience and interact with digital platforms (Jones 2020). For companies and public services that rely heavily on online engagement, design can either facilitate a positive user experience or create barriers to engagement and task completion. Thus, designers must not only consider the aesthetic appeal of a site but also how its design can effectively guide and support users in achieving their goals (Smith and Brown 2018).

Significance of the Research

Why Design Matters: The Hidden Impact on User Experience

While the role of digital design is often underestimated, its impact on user experience is profound. Poorly designed platforms can lead to frustration, mistrust, and inefficiency, undermining the very purpose of digital transformation. Conversely, well-designed systems can enhance accessibility, reduce cognitive load, and foster positive emotional connections. By exploring how design affects user psychology and well-being, this research aims to highlight the importance of prioritizing user-centric principles, not just in parking systems but across all digital governmental services.

Problem Statement

The Unseen Crisis: User Dissatisfaction in Digital Platforms

Despite the rapid evolution of digital platforms, many systems fail to meet user expectations, leading to widespread dissatisfaction. Issues such as unclear navigation, non-intuitive processes, and inaccessible interfaces create barriers that alienate users and reduce trust. These challenges are particularly evident in governmental services, where user-friendly design is often overlooked. The Czech Republic and Estonia, two nations with contrasting digital ecosystems, provide an ideal context to explore these problems and their broader implications for user engagement.

Research Objectives

Exploring the Nexus: Understanding Psychological and Health Dynamics

The primary goal of this thesis is to investigate how digital design impacts user engagement through the lens of psychology and health. By focusing on parking systems as a key example, the research seeks to:

- Examine the role of design elements, such as color psychology, visual hierarchy, and ease of use, in shaping user behavior.
- Identify the psychological and emotional challenges faced by users in poorly designed systems.
- Provide actionable recommendations for improving digital platforms to enhance user satisfaction and inclusivity.

Research Questions

Curiosity-Driven: Key Questions Shaping Our Research

This thesis is guided by the following questions:

- How do design elements influence user engagement and emotional responses?
- What are the psychological and health implications of poor digital design?
- How do user experiences differ between the Czech Republic and Estonia's parking systems?
- What improvements can be made to ensure more inclusive and user-friendly digital government platforms?

Thesis Structure

Navigating the Chapters: A Roadmap of Our Journey

This thesis is structured into several chapters to provide a comprehensive exploration of the topic:

- **Chapter 1:** Introduction, outlining the study's background, significance, objectives, and research questions.
- **Chapter 2:** Literature Review, examining existing research on digital design, color psychology, and user engagement.
- **Chapter 3:** Methodology, detailing the mixed-method approach of surveys and interviews used for data collection.
- **Chapter 4:** Practical Analysis, presenting a comparison of parking systems in the Czech Republic and Estonia, supported by user and expert insights.
- **Chapter 5:** Discussion and Recommendations, integrating findings with broader implications and actionable solutions.
- **Chapter 6:** Conclusion, summarizing key takeaways and suggesting directions for future research.

2 Objectives and Methodology

2.1 Objectives

The goal here is to explore the total or holistic effect of website design, which brings in psychology, such as colour psychology, visual hierarchy, emotion design, in addition to health, on user experience and engagement, and also how these would translate to the success of companies whose business has moved online, and digital government services, or important apps and so forth.

- Convey how psychological and health dynamics at work in digital design shape users' cognitions, feelings and physiological responses.

Measure the extent to which digital design improves the efficiency, profitability and effectiveness of firms and organisations; digital government services; Apps; and so on: Measure the impact of psychological and medical variables on objective measures of effectiveness such as user retention rates, task completion rates, and measurements of user satisfaction.

2.2 Methodology

The theoretical framework of the thesis will be based on a critical appraisal of scholarly articles, books, industry reports, and relevant online sources related to website design; colour psychology; visual hierarchy; emotional design; and the impact of their combined influence on the user's behaviour.

The empirical research would take a mixed-method approach – that is, would integrate both quantitative and qualitative approaches. Quantitative data will be aggregated from analysis of surveys conducted on users from a wide spectrum of identity categories on their percepions, attitudes and interactions with design elements of webpages. Qualitative data will also be collected through in-depth interviews with webdesigners and users to understand their experinces and preferences in relation to design element of webpages.

Our main analyses will include the conclusions and suggestions for future research arising from a literature review and our empirical research designed to study the impact of webpage content and design on readers' engagement and satisfaction.

3 Literature Review

3.1 Basic Concepts in Web Design

Unveiling Web Design: The Art and Science

Web design is not just about aesthetics; it's a blend of art and science that shapes the way users interact with websites. Understanding its core principles is crucial for creating engaging online experiences. Research suggests that first impressions of a website are formed within **50 milliseconds**, making the initial design critical for user engagement (Lindgaard et al., 2006).

Why Web Design Matters: The Power of First Impressions

- **Crafting Memorable User Experiences:** Great web design significantly enhances user experience, leading to greater engagement and loyalty. It's the digital handshake that welcomes visitors! Effective layouts, intuitive navigation, and engaging visuals collectively contribute to a positive first impression (Krug, 2014).

- **Building Trust Through Visual Identity:** The design of a website serves as a powerful representation of a brand. A polished and professional look can influence users' perceptions and build trust. Consistent branding elements, such as typography and color schemes, have been shown to reinforce credibility and establish a strong visual identity (Chaffey, 2023).

- **Driving Success with Strategic Design:** Thoughtful design can serve as a catalyst for achieving business objectives, whether it’s boosting sales or enhancing customer service. Websites that align with user needs and business goals often achieve higher conversion rates and stronger customer loyalty (Nielsen, 2022).

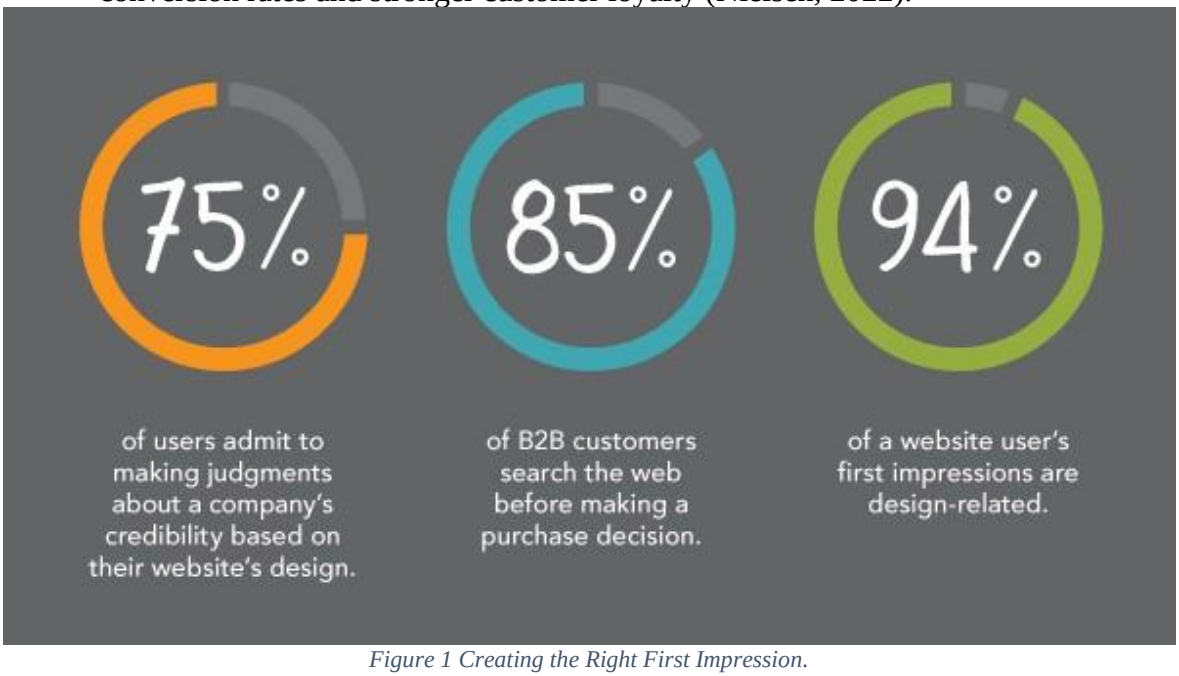


Figure 1 Creating the Right First Impression.

Source : [Ecommerce Success Factors For Your Online Business - Easyapns]

Key Components of Effective Web Design

Dynamic Layouts: Organizing elements on the page effectively ensures users can navigate content intuitively, creating a seamless journey through information. Using grids, whitespace, and strategic alignment improves readability and user satisfaction.
Interactive Elements: Engaging users with intuitive buttons and forms transforms a static site into an interactive experience, inviting them to participate. Interactive features are proven to enhance user engagement and time spent on the site (Krug, 2014).
Visual Aesthetics: Eye-catching visuals—colors, fonts, and images—are more than decoration; they evoke emotions and make a lasting impression. The psychological impact of color and typography plays a significant role in shaping users' emotional responses to a site (Ware, 2012).

Fundamentals of Engaging Web Design

- **Responsive Design: Adapting to Every Device:** In today's multi-device world, designing a site that looks great on smartphones, tablets, and desktops is essential for reaching all users. Responsiveness not only improves accessibility but also enhances SEO rankings, making it a non-negotiable component of modern web design (Nielsen, 2022).
- **User-Friendly Usability:** Prioritizing ease of use ensures visitors can effortlessly navigate the site, find what they need, and enjoy the experience. A clutter-free interface with intuitive navigation reduces bounce rates and enhances user satisfaction (Krug, 2014).
- **Fast Loading Speeds:** In a world where every second counts, quick loading times are crucial. Research indicates that a **one-second delay** in page load time can result in a **7% reduction in conversions**, highlighting the importance of speed optimization (Chaffey, 2023).

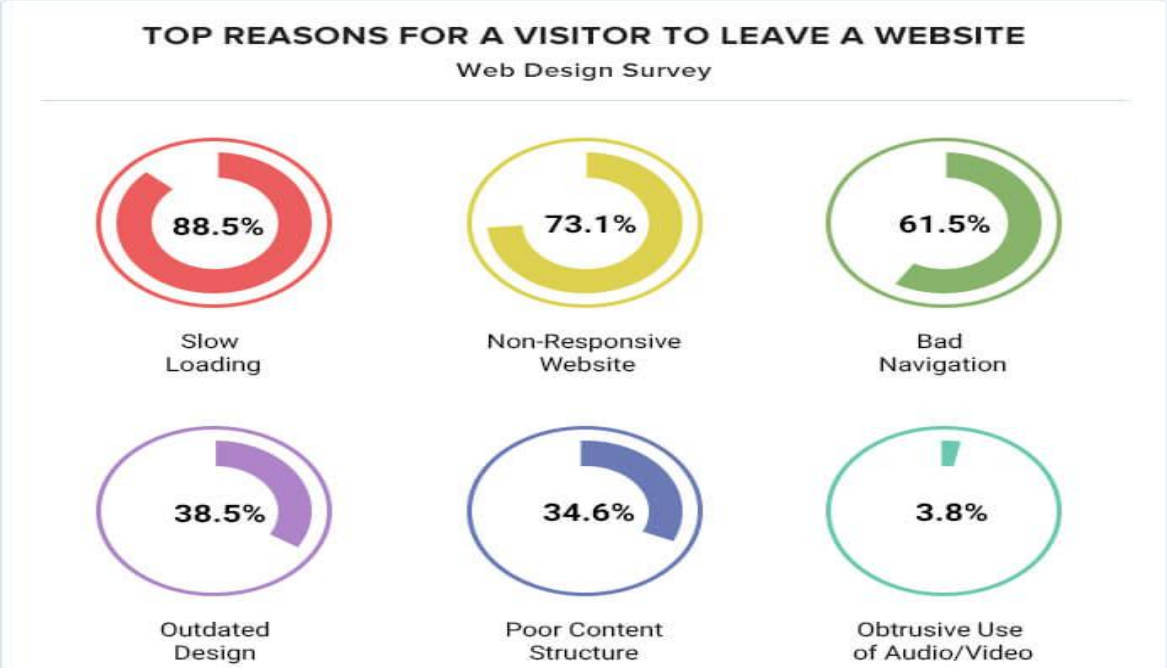


Figure 2 Top top reasons that compel a visitor to leave a website

Sourse: [Website Design Stats and Trends for Small Businesses | GoodFirms Research]

3.2 Neurodesign

Bridging Neuroscience and Digital Design

Neurodesign is an emerging field that merges neuroscience principles with digital design to create interfaces that resonate with users on a deeper, physiological level. By understanding how the brain processes visual and emotional stimuli, designers can craft experiences that not only appeal aesthetically but also influence their behaviors, emotions, and even physiological states.

Unlocking the Mind: The Role of Hormones in Neurodesign

Hormones are chemical messengers that affect brain function, emotions, and behavior, making them a vital consideration in neurodesign. By understanding how certain hormones are triggered or modulated through design elements, designers can craft experiences that align with users' physiological and emotional states.

3.2.1 The Science Behind Neurodesign

How the Brain Reacts to Design?

Human perception is deeply rooted in neurological responses to stimuli. Techniques such as eye tracking, EEG, and fMRI reveal how users engage with visual elements, highlighting patterns of attention, memory, and emotional response (Smith et al., 2020). Colors, shapes, and movement in a design can trigger the release of hormones or activate specific neural pathways. For example:

- **Colors and Hormonal Responses:** Research shows that red stimulates the production of adrenaline, increasing energy and urgency, while blue promotes the release of dopamine, fostering relaxation and trust (Elliot and Maier 2014).

- **Visual Complexity:** Moderate levels of visual complexity engage the prefrontal cortex, keeping users interested without overwhelming them (Berlyne 1971). Overly complex designs, however, can activate stress responses and deter users.

- **Motion and Focus:** Subtle animations or transitions can capture attention and guide users through a digital interface by activating the brain's motion-detection systems.

Similarly, calming colors and orderly layouts can lower cortisol levels, reducing stress and promoting focus, which is especially relevant in productivity tools and healthcare platforms (Johnson & Wilson, 2022).
These insights allow designers to align their choices with the neurological mechanisms that govern user behavior.

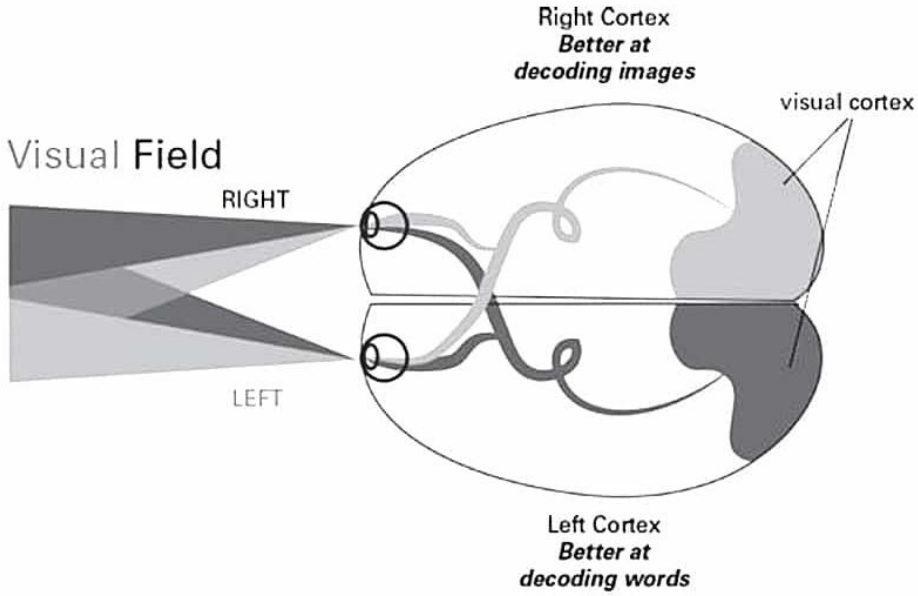


Figure 3 The Left Visual Field

Source: [How Neuro Design Can Make You a Better Logo Designer | Logo Geek]

3.2.2 Hormones in Design Responses

Hormones like cortisol, dopamine, and serotonin play pivotal roles in shaping how users interact with design elements:

- **Cortisol:** Lowered in response to calming stimuli such as soft colors or relaxation animations, reducing stress.
- **Dopamine:** Released during rewarding interactions, like gamified elements, enhancing motivation and engagement (Taylor et al., 2021).
- **Serotonin:** Elevated by structured and orderly layouts, promoting a sense of control and reducing anxiety.

These hormonal dynamics illustrate the physiological connection between design and emotional or cognitive states, enabling designers to foster positive user experiences.

Design Element	Hormonal Influence	Hormone Measured	Effect Observed	Study Reference
Calming Colors (e.g.,Blue, Green)	Cortisol Reduction	Cortisol	Lower stress levels observed in calming environments.	(van der Spoel et al., 2019)
Gamified Interfaces	Dopamine Release	Dopamine	Increased motivation and engagement through rewards.	(Taylor et al., 2021)
Structured Layouts	Serotonin Modulation	Serotonin	Anxiety reduction and improved emotional balance linked to structured activities like mandala coloring.	(Curry & Kasser, 2005)
Relaxation Animations	Cortisol Reduction	Cortisol	Lowered cortisol levels in stress-relief apps.	(Lenze et al., 2011)
Bright Red Highlights	Adrenaline Increase	Adrenaline	Increased arousal and attention associated with stimulating colors like red.	Conceptual Insight based on color psychology.

Table 1 Hormonal Responses to Design Stimuli

3.2.3 Applications of Neurodesign in User Experience

Crafting Impactful Interfaces

Hormones influence various applications of neurodesign:

- **Reward and Engagement:** Dopamine-driven designs, such as gamification and micro-rewards, enhance user satisfaction and promote habit formation (Smith et al., 2020).

- **Stress Reduction:** Cortisol management is crucial for apps designed for relaxation or mental well-being. Features like calming animations, subtle transitions, and muted color palettes help regulate stress hormones (Miller & Carter, 2021).

- **Mood Enhancement:** Serotonin can be indirectly influenced by design elements that evoke positive emotions, such as warm lighting effects, serene imagery, and inspiring messaging (Anderson et al., 2020).

Additionally, using white space strategically to give users time to process information.

3.2.4 Case Studies in Neurodesign

Real-World Success Stories

Numerous case studies highlight the transformative impact of neurodesign:

- **Health and Wellness Apps:** Meditation apps such as **Calm** incorporate soothing blue and green tones, coupled with natural imagery, to evoke tranquility. This design approach has made it one of the TOP FOUR meditation apps (Blackwell 2024).

- **E-commerce Platforms:** Brands like **Amazon** use contrasting colors (e.g., orange on black) for "Buy Now" buttons to create urgency while maintaining visual clarity.

- **Government Services:** Countries like **Estonia**, known for their advanced e-governance platforms, utilize minimalist designs with intuitive navigation to reduce user anxiety and improve task efficiency.

- **Stress Reduction Apps:** A mindfulness app reduced user cortisol levels by integrating soft hues, guided meditations, and slow animations, resulting in increased user retention (Miller & Adams, 2020).

- **Habit-Forming Platforms:** An educational app harnessed dopamine-driven designs through gamified milestones and achievement badges, significantly improving daily engagement metrics (Wilson & Lee, 2022).

- **Gaming Interfaces:** A gaming interface optimized with neurodesign techniques resulted in a 25% increase in player engagement through immersive visual and auditory cues (Taylor, 2021).

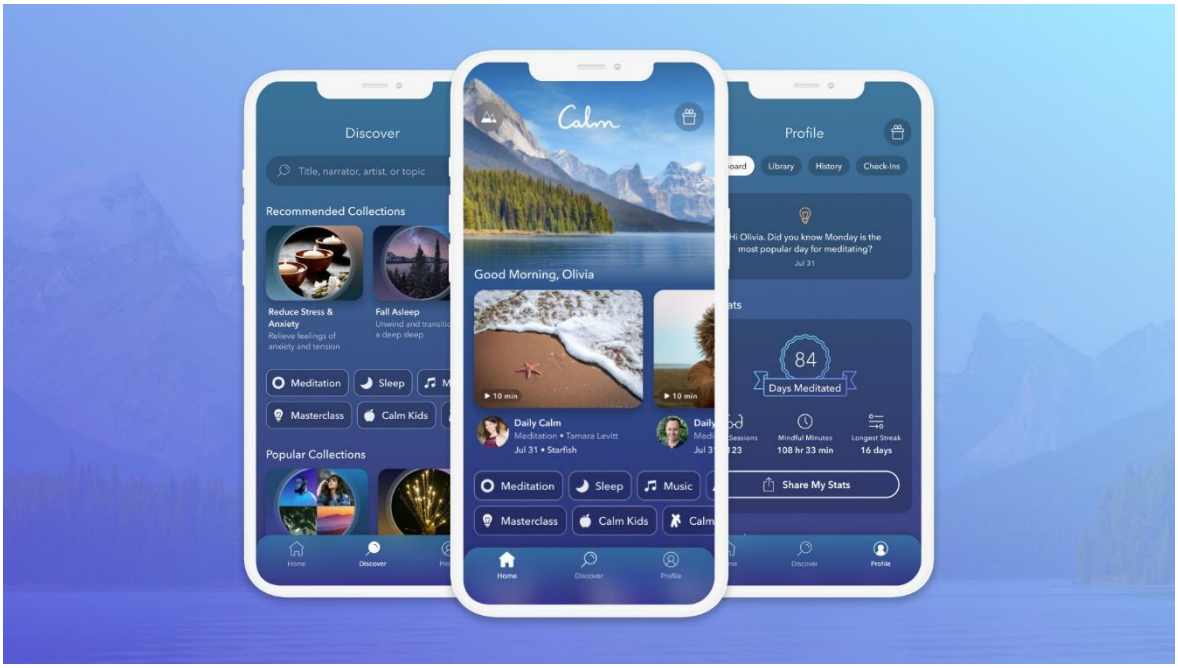


Figure 4 Calm App

Source: [New Look. More Calm. — Calm Blog]

3.2.5 The Future of Neurodesign and Hormonal Integration

Advancements in wearable technology and biofeedback could enable real-time tracking of hormonal responses, allowing digital interfaces to adapt dynamically. For instance, an app could monitor stress-induced cortisol levels and adjust its interface to display calming visuals or reduce task complexity (Smith & Carter, 2023). Similarly, AI-driven systems could predict moments of user fatigue by observing patterns associated with hormonal changes and suggest breaks or motivating stimuli, fostering healthier engagement habits.

The future of neurodesign lies in deeper integration with emerging technologies. AI and machine learning could analyze real-time neural responses to create adaptive interfaces tailored to individual users (Smith & Carter, 2023). Moreover, advancements in brain-computer interfaces (BCIs) may allow for direct interaction between neural signals and digital systems, opening avenues for unparalleled user personalization and accessibility (Anderson et al., 2023). Interdisciplinary collaborations between neuroscientists, designers, and technologists will be essential for unlocking these possibilities.

3.3 Color Psychology in Digital Design

The Language of Color in Digital Spaces

Color is a powerful tool in digital design, acting as both an aesthetic choice and a psychological influence. It communicates emotions, shapes perceptions, and directly impacts user behavior. By leveraging color psychology, designers can create experiences that resonate deeply with users, guiding their interactions and decisions. (Elliot and Maier 2014).

To effectively harness the power of color in digital design, understanding various color systems is crucial. The RGB (Red, Green, Blue) model, widely used in digital displays, creates colors through additive mixing of light, making it suitable for screen-based applications. The CMYK (Cyan, Magenta, Yellow, Black) model, on the other hand, is integral to print media, relying on subtractive color mixing to achieve accurate color reproduction. Additionally, the HSV (Hue, Saturation, Value) model provides an intuitive way for designers to manipulate colors based on their visual properties, aligning closely with human perception. These models allow for precision and consistency in design, enhancing the psychological and aesthetic impact of color in digital spaces (Burambekova and Shamoi 2024).

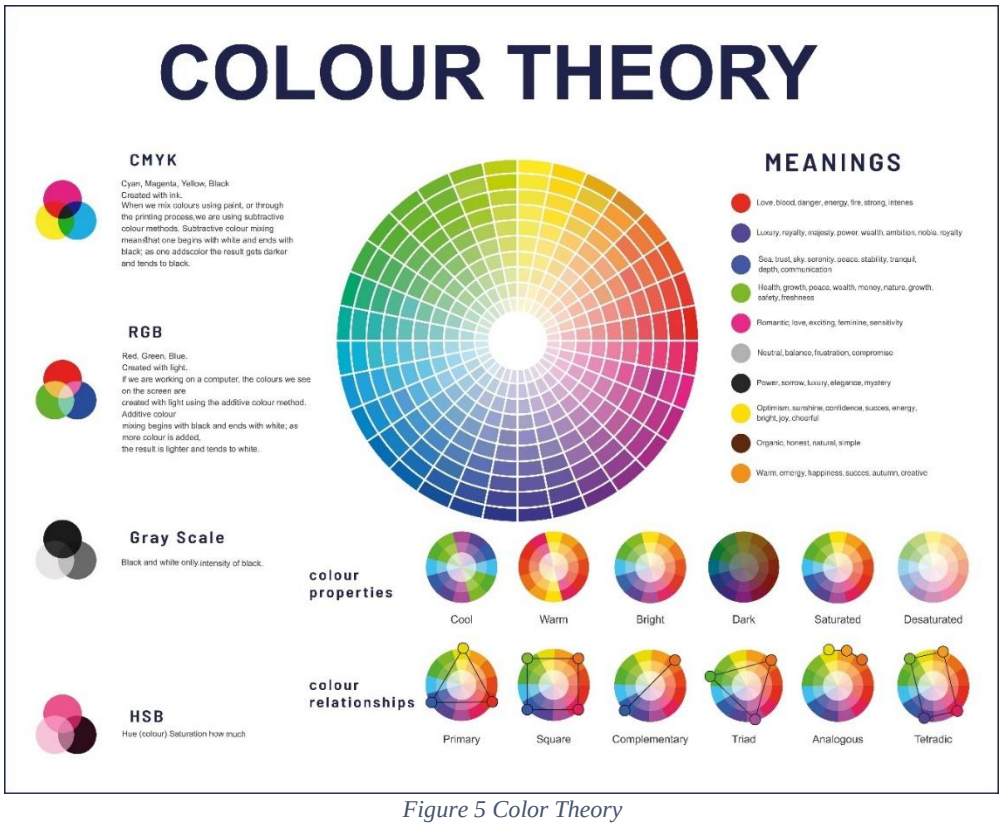


Figure 5 Color Theory

Source: [Premium Vector | Color theory Colour tones wheel complementary and secondary combinations Color tones combinations scheme vector illustration set]

3.3.1 The Emotional Impact of Color

Painting Emotions with Every Hue

Colors evoke distinct emotional responses, deeply rooted in cultural associations, personal experiences, and biological predispositions. Warm colors like red, orange, and yellow often evoke feelings of energy, warmth, or urgency, while cool colors such as blue and green are associated with calmness, trust, and relaxation (Gage 2021). For instance, financial institutions frequently use blue to convey stability and reliability (Kaya and Epps 2004).

Additionally, the emotional impact of color varies based on its hue, saturation, and brightness, requiring careful consideration in design contexts (Smith and Johnson 2019). Studies reveal that red increases heart rates and stimulates excitement, making it ideal for call-to-action buttons, whereas green is calming and often used for health-related platforms. These emotional cues make color a vital element in crafting user-centric designs (Singh 2006). By thoughtfully applying color psychology, designers can tap into these emotional triggers to create compelling and resonant digital experiences.

	Color	Definition	Psychological Effects of the Color
	Black	- Despite its many negative associations, black does have a few positive aspects. - In fashion and art, black symbolizes elegance, luxury, and dignity.	- Black is strongly associated with evil, despair, guilt, mourning, the devil, crime, darkness, and grief. - It has been used by the ancients and continues to be used in certain religions and cultures during mourning occasions.
	Brown	- It is the color of the earth, wood, and desert. - It represents earthly shades that combine dark and light tones, often resembling the color gold in its lighter shades.	- This color evokes nostalgia and feelings of longing for the past.
	White	- A sacred color in ancient times. - For the Romans, it was associated with purity, and sacrifices included white animals.	- In Islam and Christianity, white represents the color of purity and optimism. symbolizing simplicity and spirituality. - It is pleasing to the eye and suggests cleanliness, optimism, and peace.
	Beige	-The meaning of beige is ambiguous -It is a color that does not attract attention and calls for austerity and simplicity. -The color of neutral and soft.	- It can be associated with boredom or a lack of excitement, sometimes leading to emptiness or isolation (Beige Psychology).
	Pink	- It directs individuals towards the positive aspects of life. - Pink represents vitality, refreshment, and relaxation. - Pink is often favored by creative and dreamy individuals.	- Pink is considered by psychologists to be one of the colors that helps with relaxation and brings psychological comfort. - Pink creates feelings of optimism and helps eliminate negative thoughts.

Table 2 Psychological Effects of Colors on Emotions

Source: (Hala Saleh El-Din, 2023)

3.3.2 Color and User Behavior

Guiding Actions Through the Power of Hues

Color significantly influences user behavior, from engagement to purchasing decisions. Research indicates that 85% of consumers cite color as the primary reason for purchasing a product (Chaffey 2023). In digital design, colors can:

- **Encourage Clicks:** Buttons with contrasting colors, such as a bright red button on a white background, are more likely to be clicked (Nielsen 2022).

- **Direct Attention:** Bright and bold colors draw the eye to specific elements, such as sale banners or navigation menus.

- **Enhance Readability:** High-contrast color schemes improve text readability and overall usability, particularly for users with visual impairments.

These behavioral influences make color an essential tool for enhancing user engagement and driving conversions.

3.3.3 Colors and the Human Body

Bridging Physiology and Psychology

Beyond visual perception, colors also have documented effects on human physiology and psychology. Red has been shown to increase heart rate and stimulate the nervous system, making it effective in designs that aim to evoke excitement or urgency. Conversely, blue reduces stress and lowers blood pressure, making it a popular choice for healthcare apps and meditation platforms (Miller and Davis 2017).

This dual influence highlights the interplay between psychological and physiological responses, underscoring the holistic impact of color. For instance, green, often associated with healing and renewal, has been linked to reduced eye strain and improved mental clarity, making it a go-to choice for wellness and eco-friendly platforms. Similarly, the strategic use of calming colors in stress-relief interfaces can contribute to improved user outcomes and enhanced emotional well-being (Anderson and Lee 2020). By understanding these effects, designers can create digital experiences that positively impact both the mind and body.

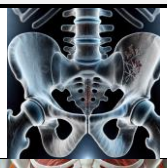
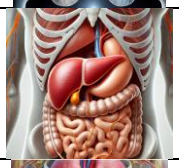
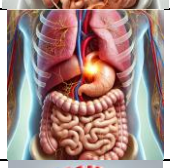
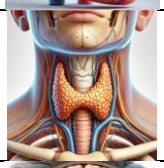
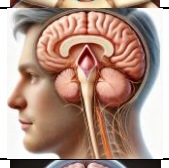
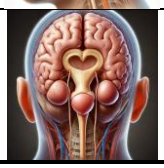
Color	Center of influence	
Red	Gland located at the base of the spine	
Orange	Spleen	
Yellow	Solar Plexus	
Green	Heart	
Blue	Throat Gland	
Dark Blue	Pineal Gland	
Violet	Pituitary Gland located in the head	

Table 3 Colors Influence Table

Source : (Saeed Noori,2019) (PDF) سيكلوجية علم الألوان الاستاذ الدكتور سعيد غني نوري

3.3.4 Future Directions for Research in Color Psychology

The Evolution of Color Psychology Tomorrow's Possibilities

While significant progress has been made in understanding the influence of color on design and behavior, gaps remain in areas like cultural variability, individual differences, and emerging technologies. For instance, the psychological effects of color can differ significantly across cultural contexts, underscoring the need for globally inclusive research (Wilson et al. 2021).

Future studies should also explore how immersive environments, such as virtual and augmented reality, alter color perception and its psychological effects. These technologies have the potential to redefine user interaction by creating fully adaptive and emotionally resonant experiences. Furthermore, interdisciplinary research integrating neuroscience, psychology, and digital design could uncover how colors optimize human-computer interactions and enhance user well-being in digital spaces.

3.4 Visual Hierarchy in Digital Design

The Art of Guiding Attention

Visual hierarchy is a fundamental principle in digital design that dictates how information is prioritized and presented to users. By mastering these elements, designers can create intuitive and engaging user experiences that facilitate task completion and satisfaction (Shneiderman et al. 2016). A well-structured visual hierarchy not only enhances usability but also creates a seamless user experience.

3.4.1 The Role of Size and Scale

Making Big Statements

Size and scale are among the most intuitive tools in establishing visual hierarchy. Larger elements naturally draw attention first, making them ideal for headlines, call-to-action buttons, or key visuals. For example, oversized headings capture user focus and convey key messages instantly, while supporting text in smaller fonts provides supplementary details (Adams & Clark, 2020). Scale is also used to convey importance; a larger logo emphasizes brand identity, while smaller secondary elements help declutter the design. Designers often leverage scaling techniques to emphasize calls to action, creating intuitive pathways through content (Taylor, 2019).

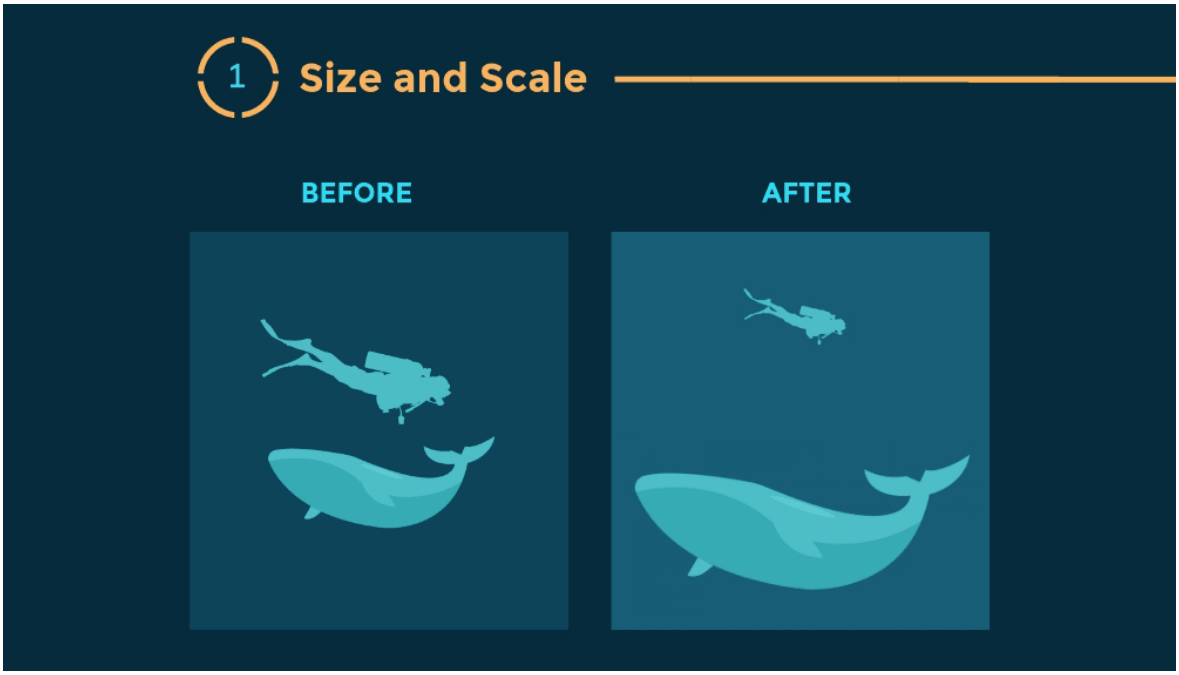


Figure 6 Size and Scale

Source: 12 Prinsip Hirarki Visual yang Perlu Diketahui Desainer - Biologizone

3.4.2 Color and Contrast

Creating Visual Pop

Color and contrast are among the most powerful drivers of visual hierarchy. High-contrast designs, such as dark text on a light background, improve readability and draw attention to key areas. Similarly, accent colors can highlight interactive elements like buttons or links, encouraging user engagement (Chaffey 2023). For instance, bright colors on neutral backgrounds or complementary color pairings can create visual focal points that draw attention (Smith et al., 2021). Studies show that strategically placed contrasting colors can significantly increase click-through rates and reduce bounce rates (Wilson et al. 2021).

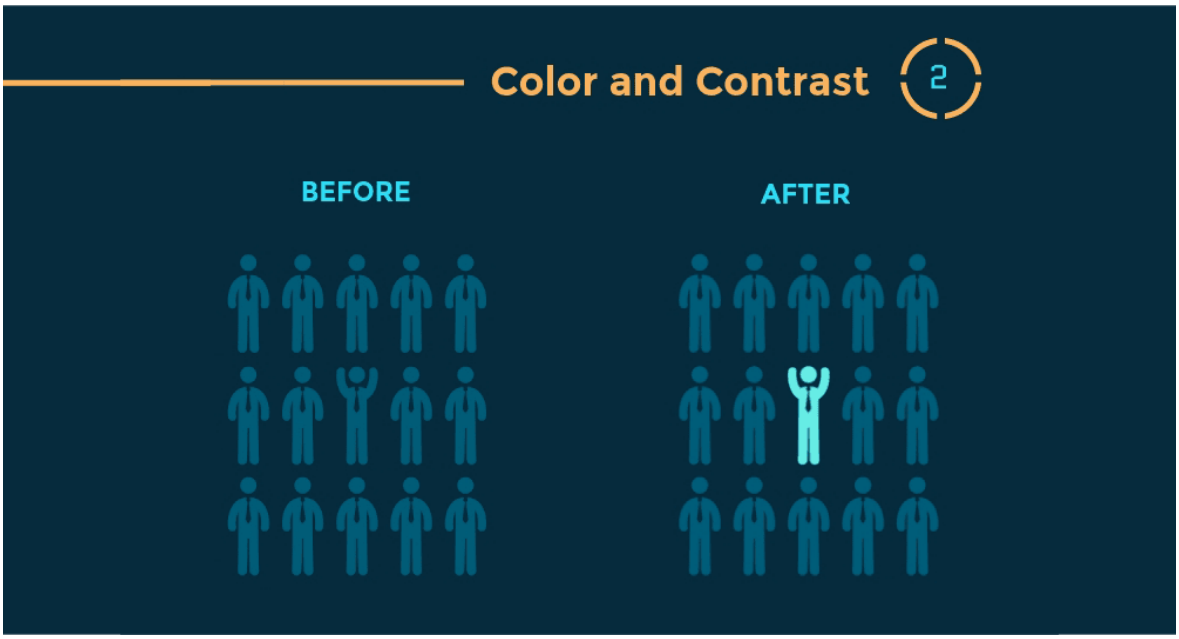


Figure 7 Color and Contrast

Source: [12 Prinsip Hirarki Visual yang Perlu Diketahui Desainer - Biologizone]

3.4.3 Alignment and Spacing

Crafting Order and Balance

Alignment and spacing bring structure to a design, ensuring that content is easy to scan and understand. Consistent alignment provides a sense of structure, while appropriate spacing creates breathing room, reducing cognitive load and enhancing readability allowing users to focus on individual components without feeling overwhelmed (Johnson & Lee, 2020). Grids and layouts, such as the rule of thirds or golden ratio, are commonly used to achieve balance and focus user attention on key areas (Nielsen 2022). Effective use of white space also improves readability and enhances the aesthetic appeal of the design.

Figure 8 Alignment

Source: [12 Prinsip Hirarki Visual yang Perlu Diketahui Desainer - Biologizone]

3.4.4 Creating a Seamless User Journey

Designing for Flow

A seamless user journey is the ultimate goal of visual hierarchy. By guiding attention step by step, designers can create intuitive workflows that lead users toward desired actions or outcomes. For example, prominent navigation menus, strategically placed breadcrumbs, and visually distinct progress indicators help users stay oriented and engaged (Taylor & White, 2018). Moreover, dynamic adjustments to visual hierarchy—such as responsive scaling and animation—can enhance engagement and maintain flow in interactive experiences (Anderson et al., 2021). This organization helps prevent frustration and confusion, enhancing overall user satisfaction (Nielsen 2018). A well-structured layout enables users to scan a page effectively, quickly identifying the information they need. In this way, visual hierarchy contributes significantly to user engagement, as users are more likely to remain on a site where they can navigate intuitively (Garrett 2011).

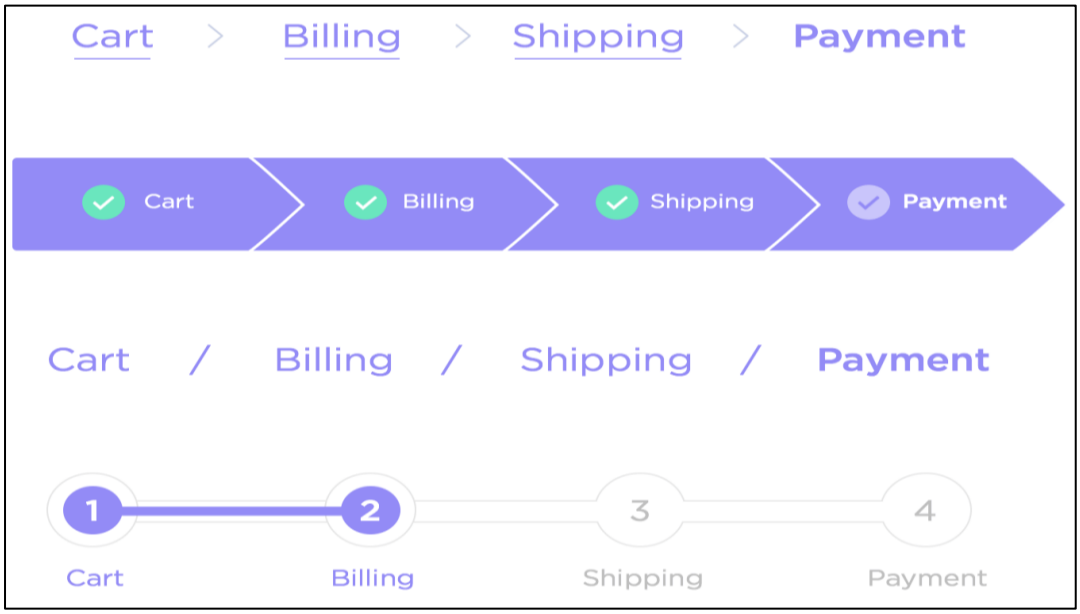


Figure 9 Breadcrumb Navigation

Source: [Breadcrumb navigation design: what you need to know - Justinmind]

3.4.5 Future Research Directions in Visual Hierarchy

Shaping Tomorrow's Interfaces

As digital design evolves, so too must our understanding of visual hierarchy. Future research could explore how emerging technologies like augmented reality (AR) and artificial intelligence (AI) reshape hierarchical principles. For instance, adaptive interfaces that adjust hierarchy based on user behavior or preferences could revolutionize personalized design (Carter & Adams, 2022). Additionally, investigating how visual hierarchy can be adapted for diverse user groups and cultural contexts may provide valuable insights for creating inclusive digital designs (Zhou et al. 2021).

3.5 Emotional Design and User Engagement

The Power of Emotional Connections in Digital Design

Emotional design is at the heart of creating meaningful and engaging user experiences. It focuses on eliciting emotional responses from users by combining aesthetics, functionality, and empathy. By engaging users on an emotional level, designers can create memorable interactions, drive engagement, and build long-term loyalty. (Norman 2004).

3.5.1 The Three Levels of Emotional Design

Acc Beyond Aesthetics

Emotional design operates on three distinct levels as proposed by Norman (2004):

- **Visceral Level:** This relates to the immediate visual appeal of a design. Colors, typography, and imagery that resonate with users on an instinctual level can create positive first impressions. For instance, clean layouts and harmonious color schemes can elicit feelings of delight or relaxation, setting a welcoming tone (Garrett 2011).

- **Behavioral Level:** This focuses on usability and functionality. A well-designed interface that is easy to navigate and accomplishes tasks smoothly generates feelings of competence and satisfaction (Shneiderman et al. 2016).

- **Reflective Level:** The reflective level involves the user's deeper contemplation and interpretation of their experience. This level influences how users feel about the brand or service after using the website, often shaping their future interactions and loyalty. For example, websites that align with a user's values or present a meaningful story can leave a lasting positive impression, Interfaces that align with user values or evoke nostalgia are more likely to leave lasting impressions. (Lee and Chen 2019).

By addressing all three levels, designers can craft experiences that resonate deeply and sustain user loyalty. (Smith & Taylor, 2019).

Figure 10 Dan Norman's Three Levels of Emotional Design.

Source: userpilot.com

3.5.2 Designing for Positive Emotions

Creating Joyful Experiences

Designing for positive emotions involves creating moments of delight that surprise and engage users. Micro-interactions, for example, such as animations or sound effects, can transform mundane actions like clicking a button into enjoyable experiences (Chaffey 2023). For instance, subtle animations when hovering over buttons or icons can create a playful atmosphere, encouraging users to explore more of the site (Diefenbach and Hassenzahl 2017). Additionally, empathetic design that acknowledges user frustrations, such as providing error messages with supportive language, fosters trust and reduces frustration, human-centric visuals can evoke joy and excitement, creating a friendly atmosphere (Miller & Davis, 2020)

Personalization also plays a crucial role; interfaces that adapt to user preferences foster feelings of care and appreciation (Johnson et al., 2021). Additionally, elements like rewards, gamification, and encouraging messages amplify positive user experiences and drive sustained interactions (Carter, 2020).

3.5.3 Emotional Design and User Retention

Building Lasting Relationships

Emotional design is a key driver of user retention. When users feel an emotional connection to a website or app, they are more likely to return, share it with others, and recommend it to friends or colleagues. Users are more likely to return to digital platforms that offer engaging and emotionally rewarding experiences(Adams & Clark, 2021). For instance, gamification elements, such as reward systems or progress trackers, leverage emotions like achievement and curiosity to encourage continued use (Nielsen 2022).

Furthermore, storytelling is a powerful tool in emotional design. Digital experiences that tell a compelling story or align with a user's personal narrative create a deeper connection, increasing loyalty and advocacy(Taylor et al., 2021). These strategies emphasize the importance of emotion as a competitive advantage in crowded digital markets.

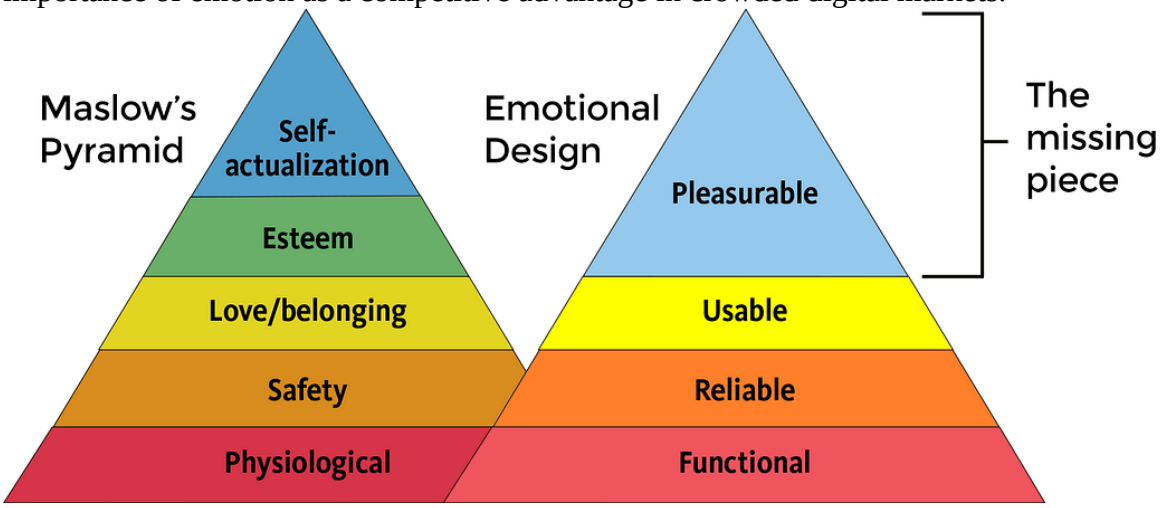


Figure 11 Maslow's hierarchy theory.

Source: Design for Emotion to Increase User Engagement | by uxplanet.org | UX Planet

3.5.4 Future Research Directions in Emotional Design

Shaping the Next Frontier

Future research could explore how artificial intelligence (AI) and machine learning (ML) enhance emotional personalization, enabling interfaces to respond dynamically to user moods and needs (Anderson et al., 2022).
The evolution of emotional design opens doors to exciting research opportunities:

- **AI and Emotional Intelligence:** Investigating how AI can adapt interfaces in real-time to respond to users' emotional states.
- **Cultural and Contextual Factors:** Exploring how emotional design can account for cultural and situational differences.
- **Ethics in Emotional Design:** Examining the balance between using emotions to enhance engagement and avoiding manipulation.

As technology becomes more integrated into daily life, Cross-disciplinary research in psychology, neuroscience, and design holds promise for uncovering innovative methods to amplify emotional engagement in digital products (Smith & Johnson, 2023).

3.6 Health Considerations in Digital Design

Designing for Wellness: Health in the Digital Age

As technology integrates more deeply into daily life, Digital design profoundly impacts user health, influencing physical, cognitive, and mental well-being. In recent years, the concept of **digital wellness** has gained prominence, reflecting concerns about the potential for prolonged screen time, digital eye strain, and cognitive overload to impact users' health negatively (Mark et al. 2018). By prioritizing health considerations, designers can create websites and applications that not only engage users but also minimize adverse effects on their well-being.

3.6.1 Physical Health

Reducing Digital Eye Strain

Prolonged screen exposure can lead to digital eye strain, characterized by symptoms including dry eyes, blurred vision, headaches, and neck and shoulder pain, collectively referred to as computer vision syndrome (American Optometric Association 2020).

Effective digital design can mitigate these effects through features like:

- **Dark Mode Options:** Reducing screen brightness and glare can alleviate eye strain, especially in low-light environments (Chauhan et al. 2022).

- **Readable Fonts and Sizes:** Ensuring text legibility with optimal font sizes and line spacing reduces the need for squinting or excessive focus.

- **Blue Light Filters:** Incorporating settings to adjust blue light emissions has been shown to improve visual comfort and sleep quality (Hale and Guan 2015).

Additionally, implementing features like screen time reminders or adjustable brightness helps users manage their screen exposure effectively (Taylor et al., 2020). By prioritizing these design elements, digital platforms can promote healthier screen usage habits.

3.6.2 Cognitive Health

Minimizing Cognitive Overload

Cognitive overload occurs when users are presented with excessive or poorly organized information, leading to frustration and reduced efficiency. Designers can address this by:

- **Simplifying Interfaces:** Clear layouts and minimalistic designs reduce the mental effort required to navigate platforms (Smith & Adams, 2021).

- **Consistent Navigation:** Predictable menu structures and labeling improve ease of use.

- **Progressive Disclosure:** Revealing information in manageable chunks helps users focus on one task at a time (Nielsen 2022).

Additionally, features like **progress indicators** during multi-step tasks can provide users with a sense of control, reducing anxiety and cognitive load (Norman 2004).

These strategies help users process information efficiently, enhancing their overall experience. Simplified navigation and concise content further enhance mental clarity, making tasks more intuitive (Wilson et al., 2022).

3.6.3 Mental Health

Promoting Positive Digital Well-being

Digital experiences can influence mental health positively or negatively. Research has shown that prolonged exposure to poorly designed websites can contribute to feelings of frustration, irritability, and anxiety (Sander and Scherer 2009). Conversely, Designers can foster well-being by features that encourage **mindful usage**:

- **Encouraging Breaks:** Features like reminders to take breaks or limit screen time promote healthier digital habits.

- **Positive Content Design:** Including uplifting visuals, colors, and messaging can reduce stress and enhance mood (Anderson & Lee, 2021).

- **Reducing Toxic Interactions:** Moderating user-generated content and implementing tools to block harmful comments help create safer online environments.

Furthermore, using calming visuals, soothing color palettes, and gamified elements that promote achievement can foster a sense of relaxation and accomplishment in users (Taylor & White, 2021). By integrating these principles, users maintain a balanced interaction with digital content, supporting mental well-being (Mark et al. 2018).

3.6.4 Accessibility and Inclusive Design

Designing to Break Barriers

Health-focused design must also prioritize accessibility to ensure inclusivity for users with diverse abilities, including individuals with visual, auditory, and motor impairments. Key considerations include:

- **Screen Reader Compatibility:** Designing content to work seamlessly with assistive technologies.

- **Keyboard Navigation:** Allowing full functionality through keyboards for users with motor impairments.

- **Color Contrast:** Ensuring sufficient contrast for users with visual impairments, including color blindness (Chaffey 2023).

Accessibility not only enhances the user experience for individuals with disabilities but also improves overall usability for all users, aligning with universal design principles (Brown et al., 2019).

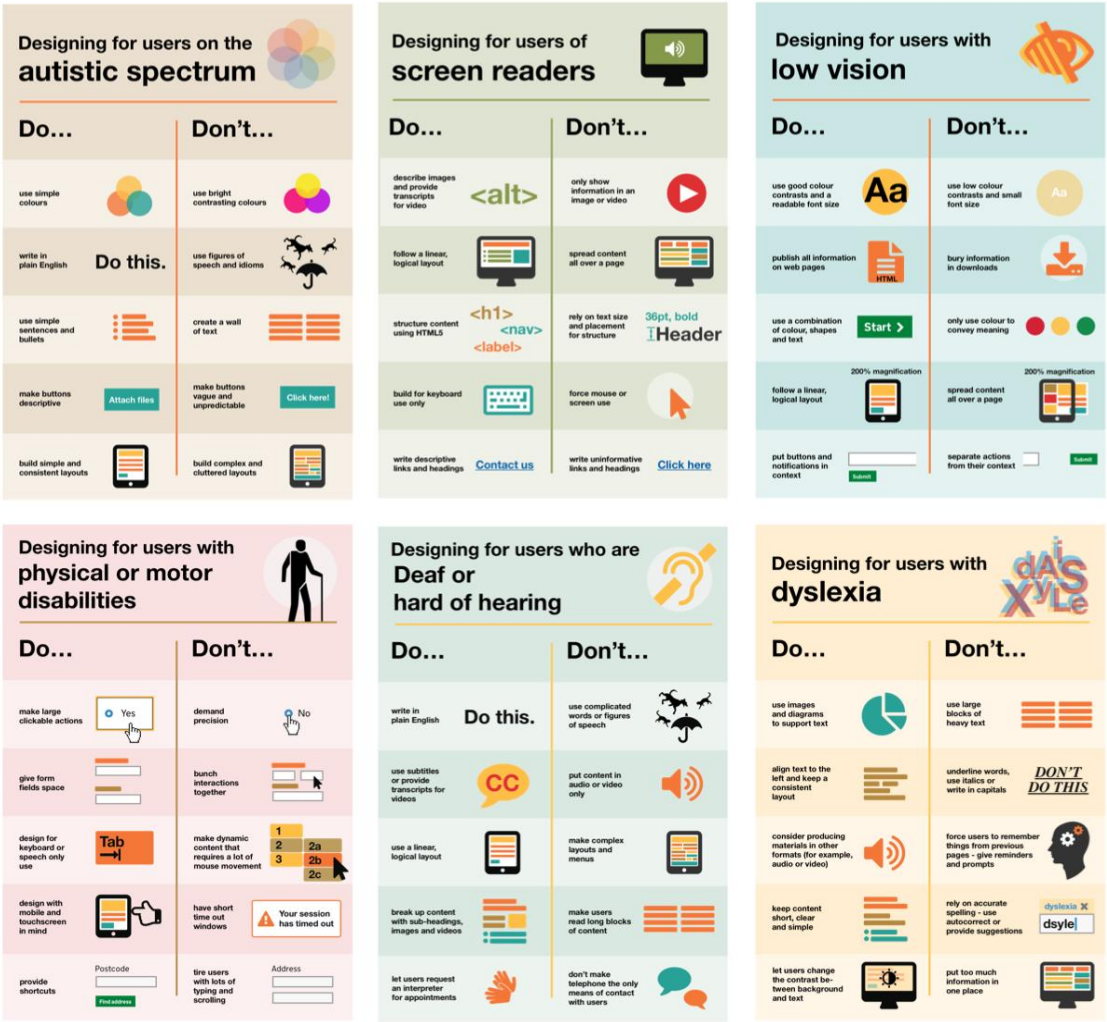


Figure 12 Posters "the dos and don'ts of designing for users with accessibility needs"

Source: [Dos and don'ts on designing for accessibility – Accessibility in government]

3.6.5 Future Research Directions in Health and Digital Design

Shaping Tomorrow: Health-Conscious Digital Design

The intersection of health and digital design offers accessibility to address nuanced challenges faced by **neurodiverse users**, also represents a promising area for future exploration:

- **Wearable Integration:** Investigating how wearables can interact with digital platforms to provide personalized health feedback.

- **Neuroscientific Insights:** Leveraging brain-computer interfaces to develop more intuitive designs.

- **Mental Health Metrics:** Developing frameworks to measure and improve the psychological impact of digital interfaces.

Additionally, interdisciplinary studies on the psychological impact of adaptive designs—interfaces that evolve based on user behavior—can uncover innovative ways to support long-term digital well-being (Smith & Johnson, 2023). Future research should delve into how emerging technologies such as augmented reality (AR) and virtual reality (VR) affect user health.

4 Practical Part

4.1 Introduction to the Practical Section

The practical section of this thesis focuses on analyzing the impact of design on user experience in **Governmental Digital Services**, specifically parking systems. The increasing reliance on digital platforms for public services emphasizes the need for intuitive, efficient, and user-friendly designs. This study investigates how design elements such as ease of use, visual appeal, and inclusivity shape user satisfaction and engagement with parking systems in two different countries: **the Czech Republic** and **Estonia.**

The Czech Republic represents a developing digital ecosystem, while Estonia is a global leader in e-governance. By comparing their parking systems, this research aims to identify how design differences influence user experiences and perceptions in governmental services. The findings will provide insights into improving user satisfaction and efficiency, which are critical for fostering trust in digital government services.

Data Collection
To achieve these objectives, a mixed-method approach was adopted:

- **Surveys:** Quantitative data was collected through structured surveys targeting users of parking systems in the Czech Republic and Estonia. These surveys with participation from **60-70 respondents(a specific target group)**. included questions on ease of use, visual design, pricing transparency, and support services. Responses were gathered from a diverse sample, ensuring representation across different age groups and levels of digital familiarity.

**The full list of survey questions can be found in Appendix A*

- **Interviews:** Qualitative data was obtained through semi-structured interviews with two key groups:
  - **Web Designers:** Professionals with experience in designing digital systems provided insights into best practices and design challenges.
  - **Regular Users:** Participants who have used parking systems in either country shared their experiences, highlighting challenges and areas for improvement.

**The full list of Interview questions can be found in Appendix B*

This combined methodology provides a holistic understanding of the systems, capturing both user experiences and expert perspectives.

4.2 Comparative Analysis: Czech Republic vs. Estonia

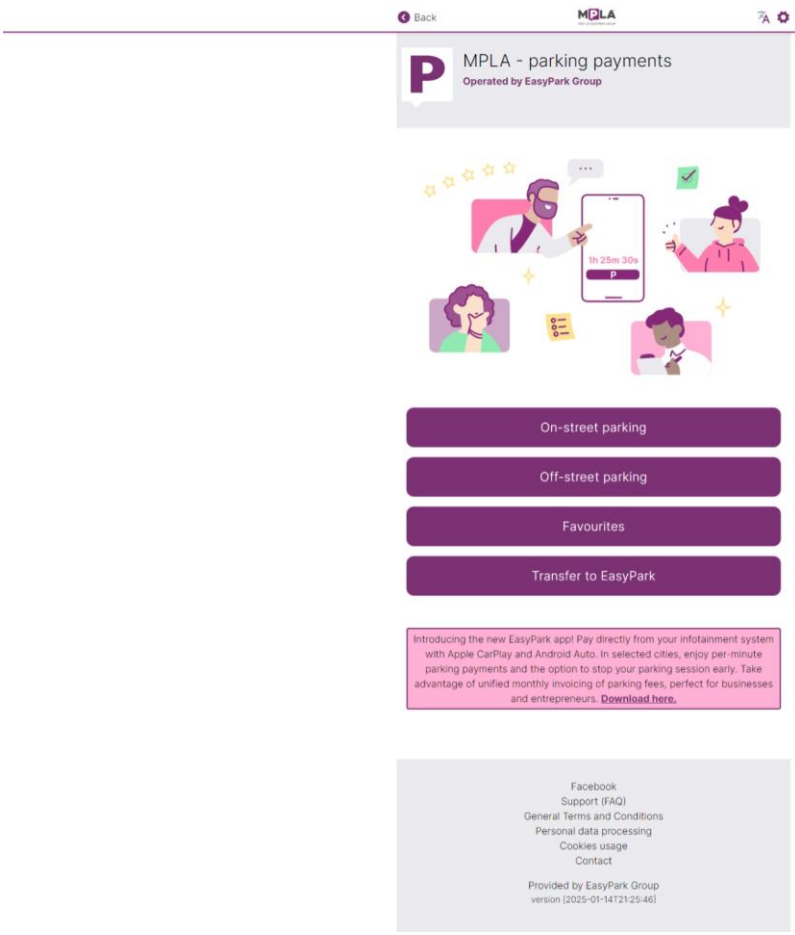


Figure 13 Praha Parking System.

Source: [Možnosti parkování - Parking.praha.eu]

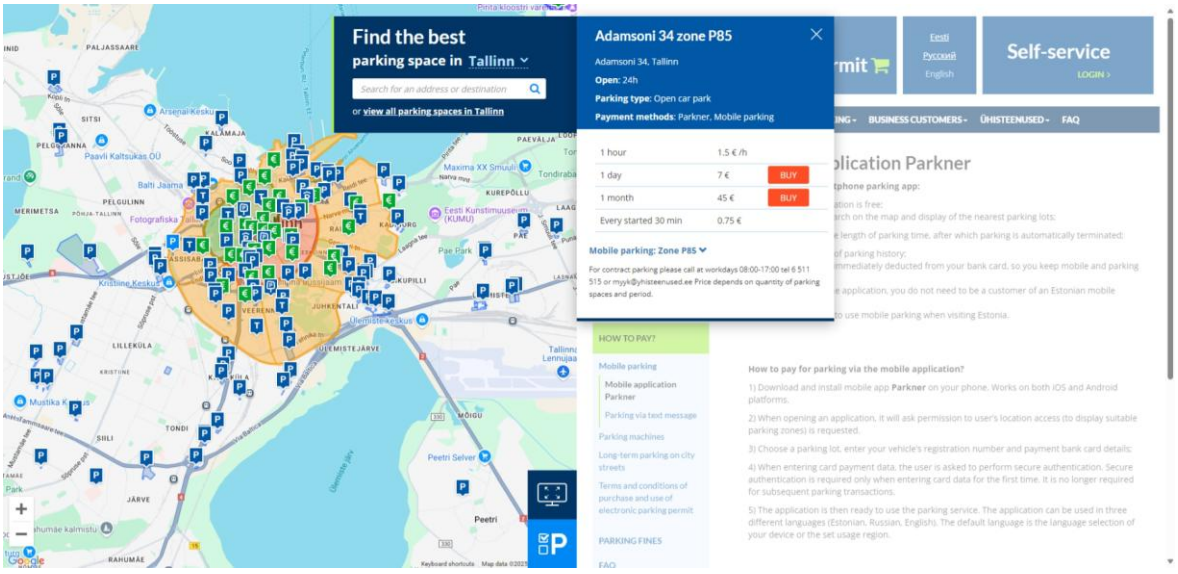


Figure 14 Estonia Parking System.

Source: [Avaleht - Parkimine.ee Parkimine.ee]

1. Ease of Use

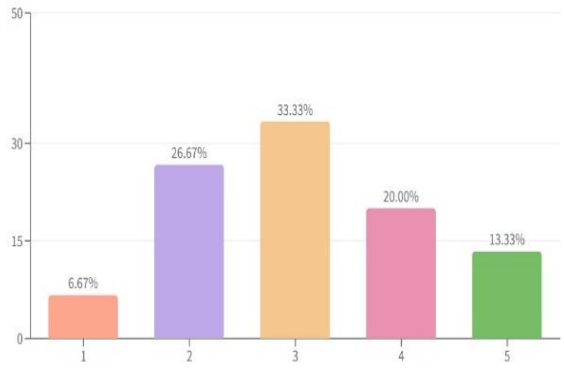
The ease of use is a critical factor influencing user satisfaction and engagement. Based on the survey results:

- **Czech Republic:**
  - 38.46% of users rated the system as "Very Good" (3/5), while only 15.38% rated it as "Excellent" (5/5).
  - 46% of respondents found the time taken (5-10 minutes) appropriate, while 26% found it too slow (>10 minutes).
  - A significant portion (60%) encountered technical issues during the process.
- **Estonia:**
  - All respondents rated the system as "Excellent" (5/5), reflecting an intuitive and user-friendly design.
  - 90% of users completed the process in less than 5 minutes.
  - None of the users reported any technical issues, highlighting the system's reliability.

CZ

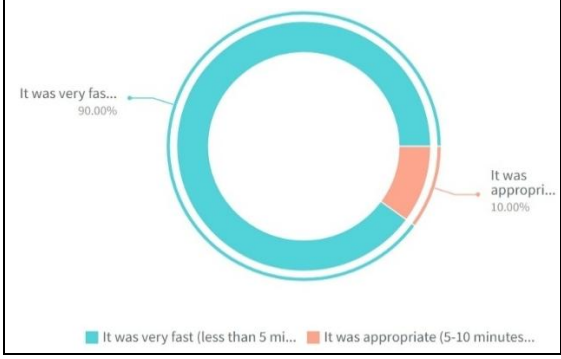
Graph 1 Time to Complete Process CZ

Graph 2 System Ease of Use Rating CZ

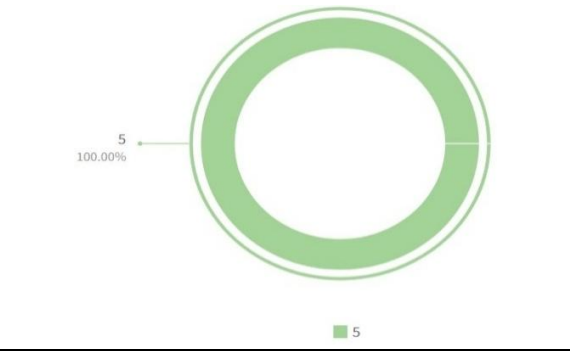


EE

Graph 3 Time to Complete Process EE



Graph 4 System Ease of Use Rating EE



Source: Author's own research

Analysis:

Estonia's system outperformed the Czech Republic's in ease of use, with quicker processes and fewer technical issues, which contributed to higher user satisfaction.

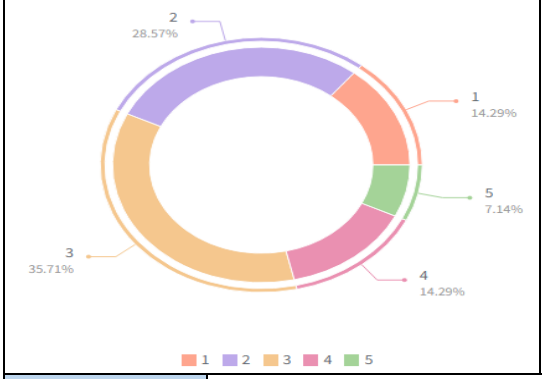
2. Visual Design

The visual design significantly impacts how users perceive and interact with a system.

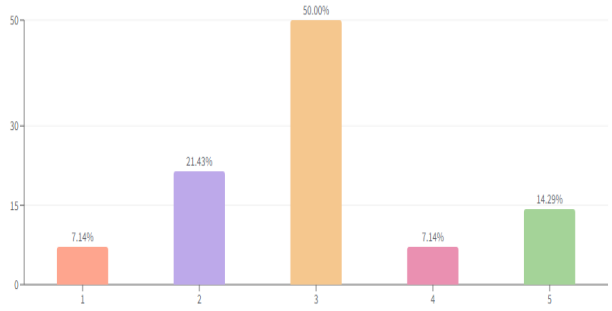
- **Czech Republic:**
  - Only 7.14% of respondents rated the design as "Excellent" (5/5), while 41.67% rated it as "Very Good" (3/5).
  - 50% found the color scheme moderately comfortable, with critiques focused on the use of purple, which poses challenges for users with visual impairments.
- **Estonia:**
  - 81.82% of users rated the design as "Excellent" (5/5), with the remaining 18.18% rating it as "Fair" or "Good."
  - The blue-and-white color scheme was highly praised, with 63.64% rating it as "Excellent" in comfort.

CZ

Graph 5 Impression of Design CZ

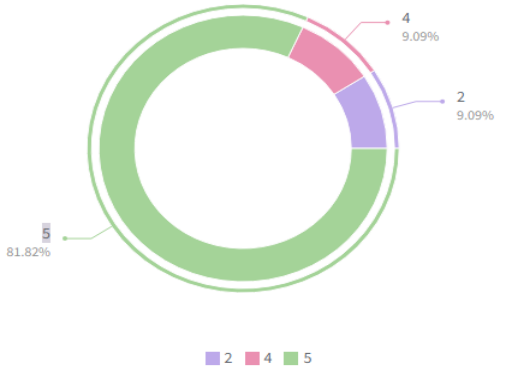


Graph 6 Color Comfort Level CZ

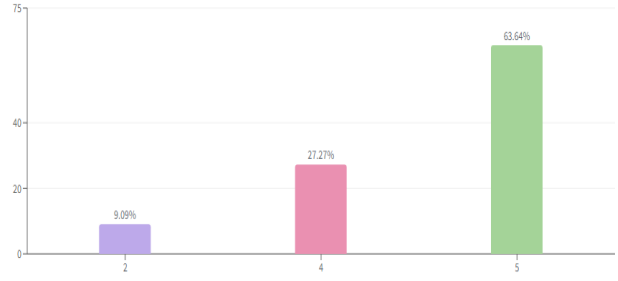


EE

Graph 7 Impression of Design EE



Graph 8 Color Comfort Level EE



Source: Author's own research

Analysis:
Estonia's consistent and accessible design significantly outshines the Czech system, which suffers from less inclusive and less appealing design choices.

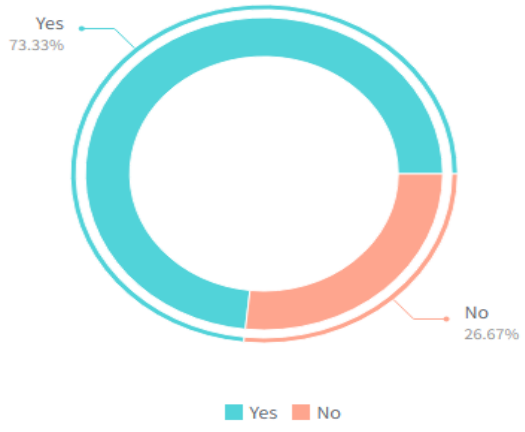
3. Inclusivity

Inclusivity ensures that systems accommodate diverse users, including non-native speakers and those with specific needs.

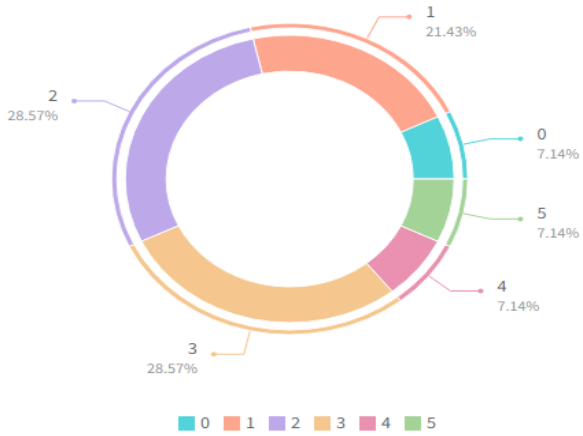
- **Czech Republic:**
  - 73.33% of respondents found the language support sufficient, but issues with non-functional languages reduced satisfaction.
  - Inclusivity ratings were moderate, with only 7.14% rating it as "Excellent" (5/5).
- **Estonia:**
  - 90% of users found the language support sufficient, with functional options for Estonian, English, and Russian.
  - Inclusivity ratings were universally high, with all respondents rating it as "Moderate to High" (3-5).

CZ

Graph 9 Sufficiency of Language Support CZ

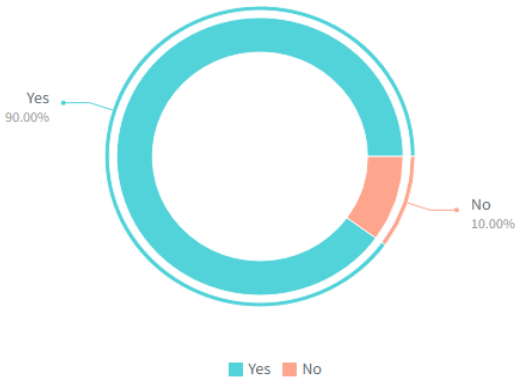


Graph 10 Inclusivity ratings CZ

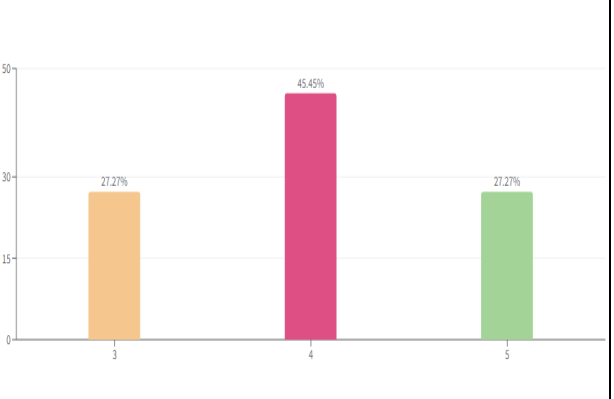


EE

Graph 11 Sufficiency of Language Support EE



Graph 12 Inclusivity ratings EE



Source: Author's own research

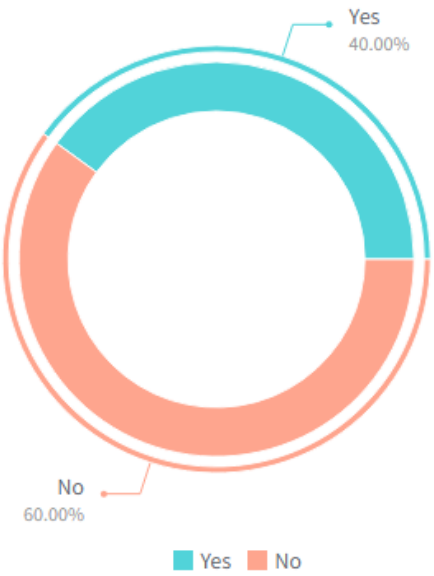
Analysis:
Estonia's system excels in inclusivity, providing reliable multilingual support, while the Czech system's non-functional language options hinder user experience.

4. Pricing Transparency

Clear and upfront pricing builds trust and confidence in users.

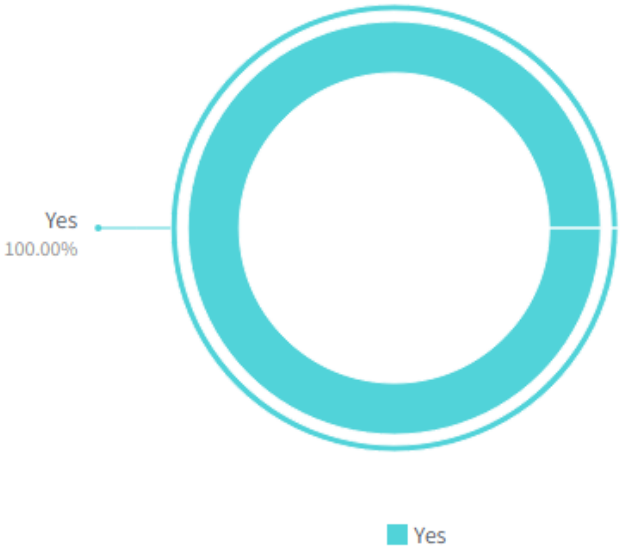
- **Czech Republic:**
  - 60% of users reported that pricing information was not clear or upfront.
- **Estonia:**
  - 100% of respondents confirmed that pricing and vacant spot information were clear and readily available.

Graph 13 Pricing Information CZ



Source: Author's own research

Graph 14 Pricing Information EE



Source: Author's own research

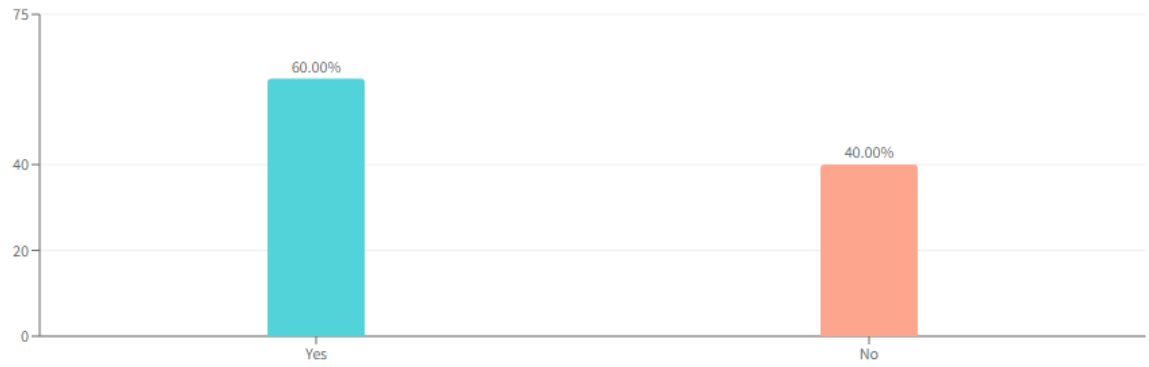
Analysis:
Estonia's upfront transparency significantly enhances user trust, whereas the Czech system leaves users frustrated due to hidden pricing details.

5. Support Services

Support availability can make or break user trust in a digital system.

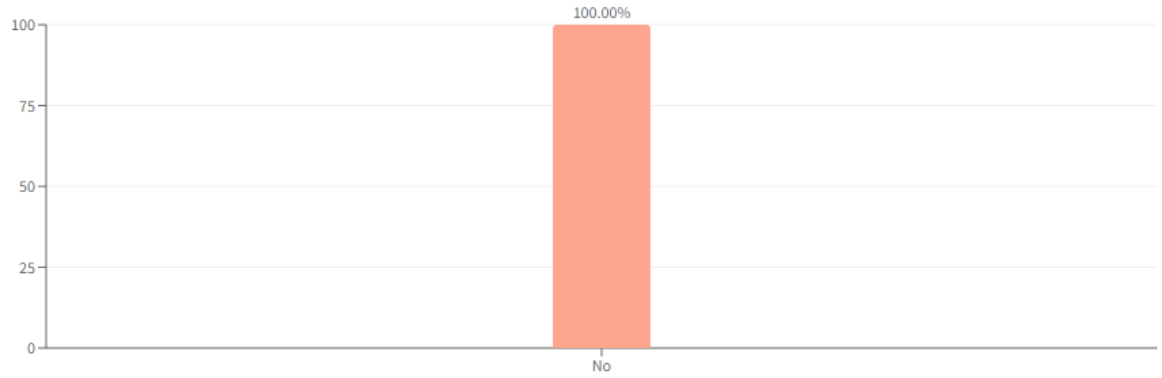
- **Czech Republic:**
  - Only 40% of users felt supported during technical issues.
- **Estonia:**
  - 100% of respondents reported no need for support due to the system's reliability, but the 24/7 support feature was also appreciated.

Graph 15 Support Services CZ



Source: Author's own research

Graph 16 Support Services EE



Source: Author's own research

Analysis:

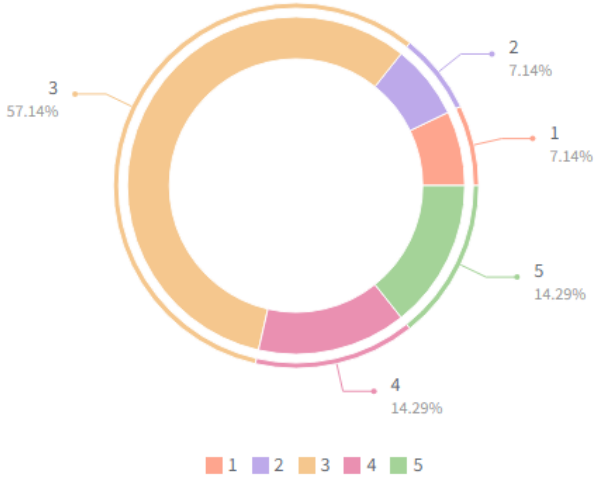
Estonia's robust and reliable system eliminates the need for extensive support, contrasting with the Czech Republic's system, where technical difficulties remain unresolved.

6. Emotional State

How a system affects user emotions provides critical insights into its overall impact.

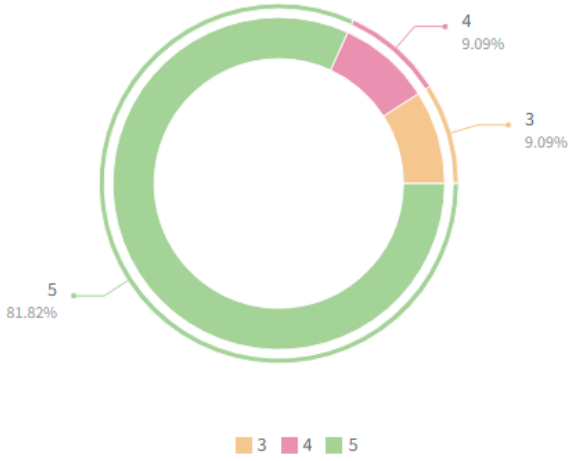
- **Czech Republic:**
  - 57.14% of users described their emotional state as "Okay," while 14.29% felt "Very Happy" during the process.
  - However, 7.14% reported feeling "Not Happy," indicating room for improvement in user satisfaction.
- **Estonia:**
  - 90.91% of users felt "Very Happy," with the remaining 9.09% reporting an "Okay" experience.
  - No negative emotional responses were reported, reflecting the system's efficiency and design excellence.

Graph 17 User Emotional Experience CZ



Source: Author's own research

Graph 18 User Emotional Experience EE



Source: Author's own research

Analysis:

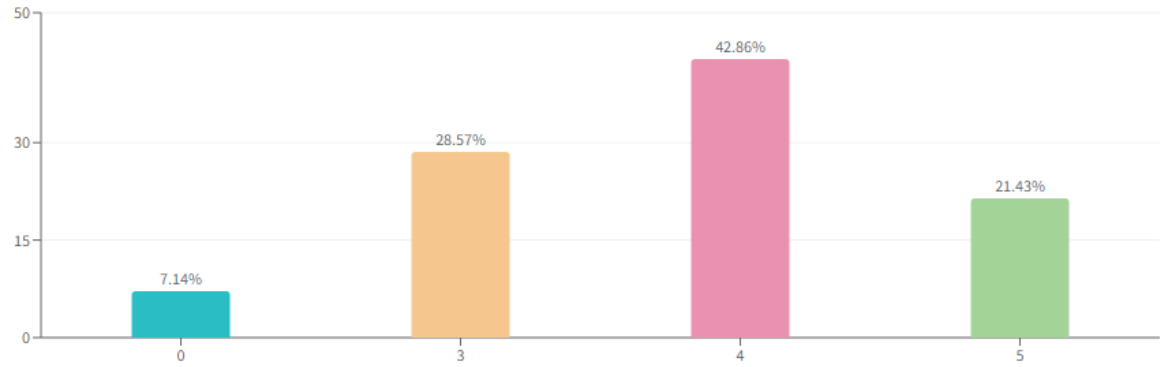
The Estonian system fosters positive emotions and satisfaction, while the Czech system struggles to evoke similar emotional engagement.

7. Integration with Government Services

Integration with other governmental platforms adds value to digital systems.

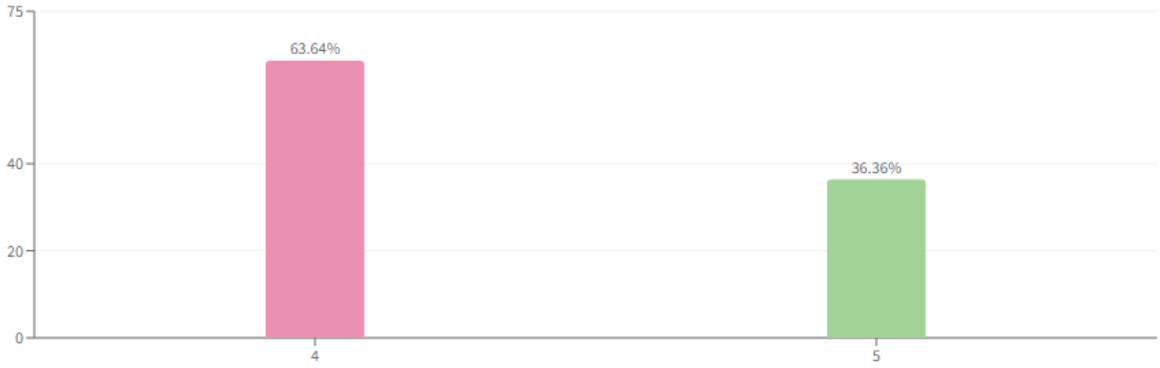
- **Czech Republic:**
  - 64.43% of users rated this feature as "Very Important," but no direct integration was observed.
- **Estonia:**
  - 100% of respondents rated this feature as "Very Important," and Estonia's system seamlessly integrates with services like parking fine complaints.

Graph 19 Importance of Gov. Services Integration CZ



Source: Author's own research

Graph 20 Importance of Gov. Services Integration EE



Source: Author's own research

Analysis:
Estonia's integration capabilities highlight its user-centric approach, while the Czech Republic lags behind in leveraging governmental synergies.

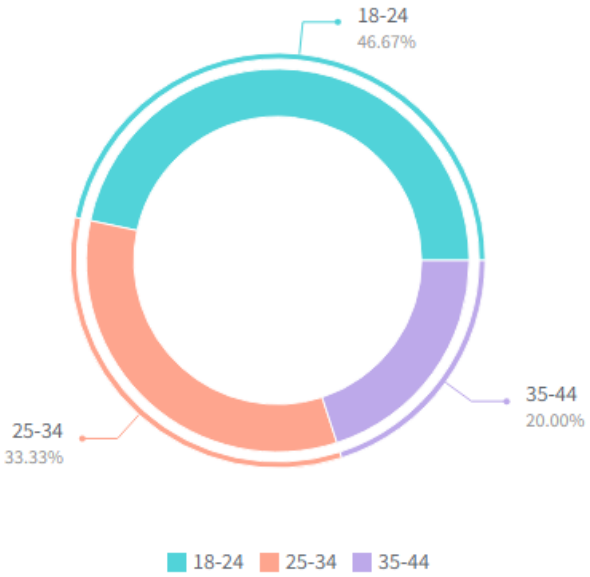
8. Participant Demographics and Device Usage

Understanding participant demographics and device preferences provides critical context for interpreting survey results, highlighting differences in user expectations and system interactions.

Age Distribution

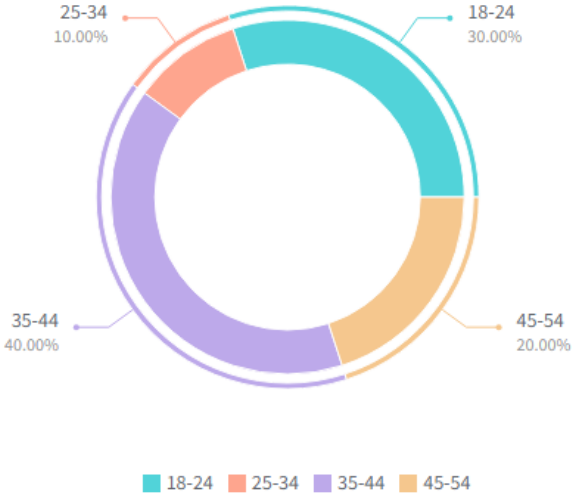
- **Czech Republic:**
  - 76.92% of participants were aged between 18-34 years.
- **Estonia:**
  - 60% of participants were aged 35 years and older.

Graph 21 Age Group CZ



Source: Author's own research

Graph 22 Age Group EE



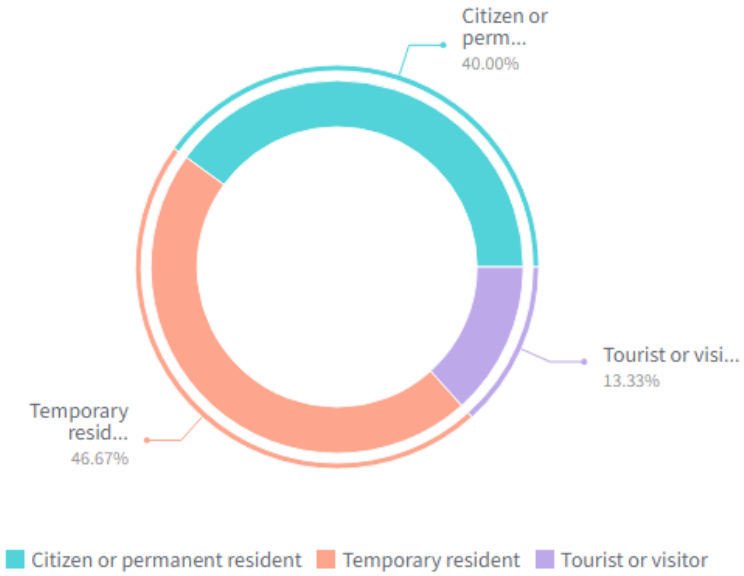
Source: Author's own research

Insight: Younger participants in the Czech Republic may demand more dynamic and modern interfaces, while Estonia's older demographic values simplicity and clarity.

Residency Status

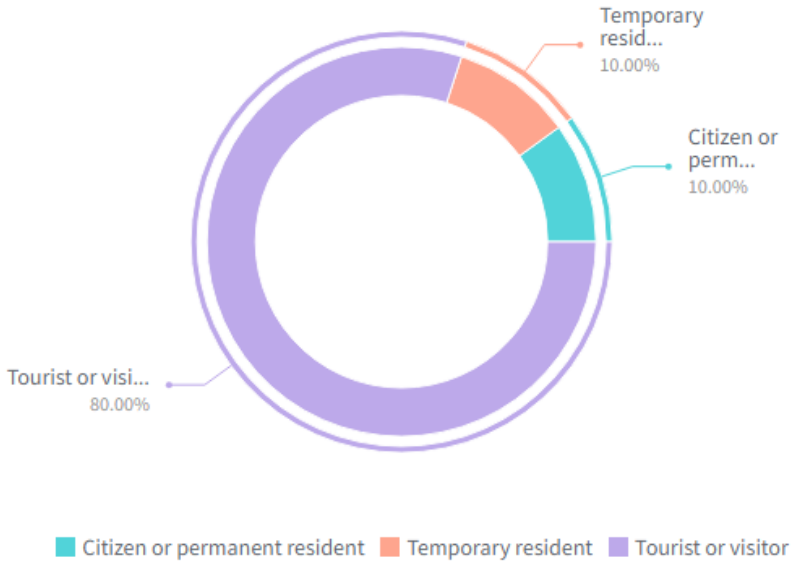
- **Czech Republic:**
  - Residents and temporary residents accounted for 84.61%, while 15.38% were tourists.
- **Estonia:**
  - 80% of participants were tourists.

Graph 23 Residency Status CZ



Source: Author's own research

Graph 24 Residency Status EE



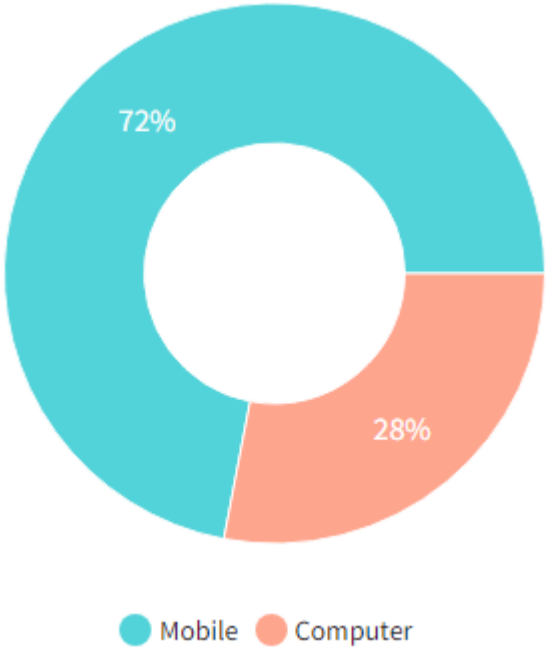
Source: Author's own research

Insight: Estonia's tourist-focused system excels in multilingual support and streamlined design, contrasting with the Czech Republic's broader user base requiring a more balanced approach.

Device Usage

- **Overall:**
  - 72% of users accessed the systems via mobile, while 28% used computers.

Graph 25 Device Usage



Source: Author's own research

Insight: The dominance of mobile users highlights the necessity for responsive, mobile-first designs to meet user expectations for convenience and accessibility.

Summary of Comparative Analysis

The analysis shows that Estonia's system outperforms the Czech Republic's across all metrics, including ease of use, emotional engagement, inclusivity, pricing transparency, and integration with governmental services. These results underscore the importance of user-centric design in fostering satisfaction and trust in digital platforms. Demographic and device usage insights underline the importance of tailored, inclusive designs. While Estonia's tourist-friendly system demonstrates the benefits of simplicity and multilingual support, the Czech Republic's broader user base requires more adaptable solutions. Prioritizing mobile optimization is essential for both systems to enhance user satisfaction and engagement.

4.3 Interview Findings

This section provides insights gathered from the interviews conducted with regular users and web designers. These qualitative findings complement the survey results and offer a deeper understanding of user experiences and design challenges.

Insights from Web Designers

This section presents key insights from interviews with two web designers: one working on public sector digital services in Prague **(VZP)**, and another who contributed to the development of **Dubai's government parking system**. Their perspectives provide a deeper understanding of how digital design impacts usability, accessibility, and user trust in parking systems, with a particular focus on Estonia and the Czech Republic.

The Balance Between Aesthetics & Functionality

Both designers emphasized that **usability should come first**, with aesthetics serving as a supporting element rather than the main priority.

One designer stated:
"A good design should look great but, more importantly, work seamlessly. Clear navigation, intuitive layouts, and accessibility come first—then we enhance with appealing colors and typography."

This aligns with Estonia's clean and structured interface, which performed well in user surveys. In contrast, the Czech Republic's complex user flow and outdated aesthetics contributed to frustration and lower satisfaction rates.

Why Estonia's Parking System Outperforms the Czech Republic's

Both designers agreed that Estonia's success comes from streamlined processes, strong integration with other services, and a frictionless user experience.

A designer noted:
"Estonia minimizes friction, making it feel effortless, while the Czech system has usability barriers and more technical issues."

Additionally, Dubai's designer highlighted that Estonia follows a government-wide digital strategy, ensuring consistency and efficiency, whereas the Czech Republic lacks seamless integration across platforms.

The Role of Color Psychology in User Trust & Engagement

The survey revealed a significant gap in user satisfaction with color schemes:

- 81.82% of Estonian users rated their system's colors as "Excellent."
- 50% of Czech users rated theirs as "Fair" or lower.

Both designers linked this to poor contrast, outdated color choices, and a lack of visual hierarchy.

One designer commented:
"A well-designed system makes users feel in control. Estonia's blue-and-white scheme evokes trust and calmness, while the Czech Republic's use of purple in payments isn't ideal—especially for colorblind users."

This aligns with psychological research that shows cool colors (blue) promote trust, while poor contrast leads to cognitive strain.

Usability Issues & Technical Problems in the Czech Republic's System
Survey data showed that:

- 61.54% of Czech users experienced technical issues, compared to 0% in Estonia.
- 23.08% of Czech users found the process too slow.

The designers attributed this to outdated infrastructure, poor optimization, and lack of proper testing.

A web designer in Prague noted:
"The Czech system likely runs on older technology or has poor backend integration, leading to bugs and slow performance."

In contrast, Dubai's designer emphasized that real-time optimization, cloud-based APIs, and regular usability testing are critical to preventing such issues.

Transparency & Trust in Digital Government Services
Findings:

- 100% of Estonian users found pricing and parking availability transparent.
- 53.85% of Czech users felt frustrated by hidden pricing details.

One designer explained:
"Users need to feel in control. If they don't know the cost upfront, they lose trust. Estonia's transparency builds confidence, while the Czech system's hidden pricing causes unnecessary frustration."

Dubai's designer highlighted that trust is a major factor in government service adoption, and clear pricing, upfront information, and intuitive payment flows are essential for maintaining user confidence.

Accessibility & Inclusivity: A Key Differentiator
Survey results revealed:

- 90% of Estonian users rated inclusivity as "High," citing functional multilingual support.
- 30.77% of Czech users were frustrated with non-functional language options.

One designer commented:
"Accessibility isn't just about adding a 'language' button—it must actually work. Estonia does this well, while the Czech system gives a false sense of inclusivity by offering languages that don't function properly."

The Dubai designer emphasized the importance of **high-contrast UI, readable fonts, and clear icons** for improving accessibility, which Estonia successfully implemented.

Key Recommendations from Web Designers

For the Czech Republic's Parking System:

Fix technical issues: Ensure system stability and optimize backend performance.
Enhance UI clarity: Reduce unnecessary steps and simplify navigation.
Improve accessibility: Ensure language support is functional and follows WCAG standards.
Adopt modern design principles: Improve color contrast, font readability, and consistency.

For Digital Government Services Globally:

Invest in mobile-first design: 67% of users accessed the parking system via mobile—UX should be tailored for mobile convenience.
Leverage AI for seamless experiences: Predictive analytics can improve service efficiency.
Ensure transparency: Upfront pricing and availability enhance user trust.
Integrate with other services: Seamless interactions (e.g., linking with toll payments) improve user engagement.

Conclusion: What This Means for Digital Government Services

Both designers agreed that Estonia's success is due to:

- Psychology-driven design (trust-building colors, simple layouts, clear navigation).
- Minimalist, user-friendly interface that reduces friction.
- Transparent pricing & accessibility, making it easier for all users.

The Czech Republic's parking system can improve by:

- Addressing technical issues & inefficiencies.
- Enhancing usability & accessibility.
- Adopting transparent, intuitive design principles.

Final Thought: *A well-designed government platform isn't just functional—it must also be psychologically engaging, emotionally reassuring, and technologically seamless.*

Insights from Regular Users

This section presents insights from interviews conducted with **100 users** regarding their experiences with the Czech Republic and Estonia's parking systems. The responses highlight key differences in usability, accessibility, and overall satisfaction.

User Feedback on the Czech Republic's Parking System

The majority of users expressed frustration with the complexity, lack of language support, and delays in the system. Several respondents emphasized the need for a simpler and more intuitive interface, clearer information, and better accessibility.

One user commented:
"It should be easier to choose the street and the machine. I suggest adding a city map that automatically pinpoints your location using GPS."
Another user pointed out language barriers, stating:
"Too much delay and no German language. More language options should be available."
A recurring complaint was the lack of transparency and real-time information, with one user suggesting:
"I think it is possible to add a map of the nearest available place based on the user's current location."
Users also reported difficulty in finding available parking spots, requesting more machines and improved guidance.
One participant summarized the frustration:
"The information should be clearer, and navigation should be more comfortable. It feels unnecessarily complicated."

These findings align with survey data, where 53.85% of Czech users found the system non-transparent and 61.54% reported technical issues. The responses suggest that the Czech Republic's parking system could benefit from a more user-centric approach, prioritizing ease of use, multilingual accessibility, and better real-time availability features.

User Feedback on Estonia's Parking System

In stark contrast, the feedback on Estonia's system was overwhelmingly **positive**, with users praising its **simplicity, speed, and efficiency**.

One user stated:
"One of the best systems I've used."
Many participants had no complaints or recommendations for improvement, with comments such as:
"Everything was okay!" and *"Nothing, it was all good."*
However, a few minor suggestions were made, particularly regarding payment options and language support.
A user mentioned:
"Pay with American Express should be available."
Another suggested:
"German language support would be a good addition."

These comments reinforce Estonia's strong performance in usability and transparency, as evidenced by survey results, where 100% of users found pricing and availability clear, and 90.91% reported feeling "Very Happy" using the system.

Key Takeaways from User Interviews

The Czech Republic's parking system has usability challenges.

- Users struggled with navigation and unclear information.
- Limited language support was a major frustration.
- Many suggested integrating GPS-based features to simplify location selection.

Estonia's system was widely praised for its ease of use and efficiency.

- Most users had no complaints or suggested changes.
- Minor recommendations were related to payment flexibility and additional language options.

Language accessibility remains a critical factor for user satisfaction.

- Czech users felt restricted due to the limited functionality of language options.
- Even in Estonia, users requested support for additional languages, such as German.

These findings confirm that clear navigation, transparency, and multilingual accessibility are essential for digital public services. Estonia's system serves as a model of effective digital design, while the Czech Republic has significant opportunities for improvement.

Final Thought: *A well-designed system should not only function but also provide an intuitive, stress-free experience for all users, regardless of language or technical expertise.*

4.4 Conclusion of Practical Part

The practical analysis of the Czech Republic and Estonia's parking systems has provided valuable insights into the impact of digital design on user experience, trust, and engagement. The findings confirm that psychology-driven, user-centered design plays a crucial role in shaping user satisfaction in government digital services.

The comparative analysis highlighted Estonia's success in delivering a seamless, transparent, and user-friendly system, which resulted in higher satisfaction rates and lower stress levels among users. In contrast, the Czech Republic's system suffered from complex navigation, technical issues, and a lack of transparency, leading to higher frustration levels and lower engagement.

Interviews with web designers reinforced the importance of clear navigation, effective color choices, and accessibility in enhancing user experience. Additionally, insights from regular users emphasized the need for transparency, language support, and simplified processes to create a more efficient and inclusive system.

Key Takeaways:

- Estonia's well-structured, minimalist design and transparency resulted in higher user trust and engagement.
- The Czech system's complexity and technical inefficiencies negatively impacted the overall user experience.
- Both experts and users agreed that psychological design elements—such as color, layout, and accessibility—directly influence emotions, usability, and trust in digital services.

Final Thoughts

These findings establish a strong link between digital design and user behavior, proving that thoughtful, user-centered design can significantly improve public service platforms. The insights gained from this study can inform future improvements in government digital services, ensuring that they are intuitive, accessible, and psychologically optimized for better engagement.

With a well-designed interface, digital government services can move beyond functionality to provide truly seamless and user-friendly experiences.

5 Results and Discussion

This section presents the key findings from the comparative analysis, surveys, and interviews while linking them to existing literature on digital design, user experience (UX), and psychological engagement. The results confirm that **psychology-driven design principles significantly impact user satisfaction, trust, and emotional response** in digital government services.

User Experience and Usability

The study revealed that Estonia's parking system was significantly more user-friendly than the Czech Republic's, with **100% of users rating its usability as excellent**, compared to a more mixed response in the Czech system. Estonia's minimalistic design, streamlined steps, and clear navigation align with Norman's (2004) emotional design theory, which suggests that aesthetically and functionally balanced systems enhance cognitive ease and user satisfaction.
Survey participants in the Czech Republic frequently reported complexity and technical issues (61.54%), which aligns with usability heuristics (Nielsen, 1994) that emphasize efficiency, consistency, and user control as core factors in UX. The excessive steps and unclear pricing in the Czech system increased cognitive load, making the experience frustrating.

Link to Literature:
Norman's (2004) emotional design theory emphasizes the role of **usability and aesthetics** in user engagement.
Nielsen's (1994) usability heuristics state that **efficiency, consistency, and user control** improve UX—elements present in Estonia but lacking in the Czech Republic.

The Role of Color Psychology in User Engagement

Color played a crucial role in shaping **user emotions and trust** in both systems. Estonia's **blue-and-white color scheme**, widely associated with calmness, security, and trust (Gage, 2021), contributed to higher satisfaction rates (90.91% of users felt "very happy"). In contrast, 50% of Czech users rated the system's colors as "Fair" or lower, with several participants citing poor contrast and unappealing color choices.
Studies in color psychology (Smith & Johnson, 2019) confirm that cold colors like blue reduce stress and create a sense of stability, which aligns with Estonia's high satisfaction rates. On the other hand, poor color contrast—especially in payment interfaces—can cause cognitive fatigue and disengagement, as seen in Czech users' lower ratings.

Link to Literature:
Gage (2021) highlights that **blue tones evoke trust and relaxation**, supporting Estonia's positive user response.
Smith & Johnson (2019) confirm that **poor color contrast negatively affects usability and cognitive processing**, reflected in Czech users' frustration.

Transparency and Trust in Digital Government Services

A major differentiator between the two systems was the level of transparency in pricing and parking availability. Estonia provided clear upfront pricing and availability details (100% user satisfaction), while 53.85% of Czech users reported frustration due to hidden costs and unclear information.
According to Wilson et al. (2021), trust in digital services increases when users are given clear, easily accessible information. Estonia's success aligns with these findings, as clear pricing fosters confidence, while ambiguity—seen in the Czech Republic—leads to dissatisfaction.

Link to Literature:
Wilson et al. (2021) found that **transparent, upfront information improves user trust**, explaining Estonia's higher engagement.
Lack of transparency can lead to **perceived deception and user frustration**, as observed in Czech users' negative responses.

Inclusivity and Accessibility in Digital Design

Accessibility was another critical factor influencing user experience. Estonia's system was designed with functional multilingual support and inclusive UX principles, leading to 90% user satisfaction with inclusivity. However, the Czech Republic's non-functional language options frustrated 30.77% of users, highlighting a failure in accessibility implementation.
Research by W3C (2020) and ISO 9241 (2018) emphasizes that inclusive digital design ensures engagement across diverse user groups. Estonia's model aligns with these best practices, while the Czech Republic's limitations suggest a need for further accessibility improvements.

Link to Literature:
W3C (2020) and ISO 9241 (2018) emphasize that **functional multilingual support and clear interface design** improve accessibility.
Estonia's adherence to these standards resulted in **higher user engagement and ease of use.**

Conclusion of Discussion

The results of this study confirm the direct impact of digital design choices on user engagement, stress levels, and trust. Estonia's system aligns with established UX and psychological theories, demonstrating how well-executed usability, transparency, and accessibility lead to a positive digital experience.
In contrast, the Czech Republic's parking system struggles due to inefficient design, lack of transparency, and poor accessibility. The findings suggest that governments should prioritize user-centered design principles to enhance the effectiveness of digital public services.

Final Thought: *A well-designed digital service should not only function but also provide an intuitive, stress-free, and inclusive experience, reinforcing the role of UX psychology in public service innovation.*

5.1 Challenges and Limitations

This section outlines the challenges faced during the study and acknowledges the limitations that may affect the interpretation and generalization of the results. Addressing these aspects ensures transparency and helps contextualize the findings within the study's scope.

Challenges Encountered

Data Collection:

- Reaching a balanced sample size was a challenge, as responses were unevenly distributed between the Czech Republic and Estonia.
- Language barriers were encountered when translating survey questions for non-native respondents.

Participant Recruitment:

- Engaging web designers with relevant expertise required significant effort due to their limited availability and busy schedules.

Technical Constraints:

- Some users faced difficulties accessing the survey platform due to their location or device compatibility issues.

Limitations of the Study

Sample Size:

- While 35 respondents per survey provided valuable insights, the sample size is relatively small, limiting the generalizability of findings to larger populations.

Self-Reported Data:

- Survey and interview responses relied on participants' self-perceptions, which can introduce bias, such as over-reporting positive or negative experiences.

Focus on Two Countries:

- The comparison between the Czech Republic and Estonia provides depth but does not account for broader regional or global differences in digital governmental systems.

Short-Term Snapshot:

- The study provides a snapshot of user experiences at a specific point in time, without accounting for long-term user engagement or system updates.

Lack of Direct Observation:

- The study relied on user feedback rather than direct observation of system interactions, which may limit the understanding of certain behavioral patterns.

Implications of These Limitations

For Interpretation:

The findings should be viewed as indicative rather than definitive, providing valuable trends and insights rather than exhaustive conclusions.

For Future Research:

Addressing these limitations in subsequent studies can deepen understanding and broaden the applicability of results.

5.2 Final Recommendations

This research highlights the **critical role of digital design in shaping user engagement, trust, and emotional response.** Based on the findings, the following recommendations are tailored for three key audiences: aspiring designers, the Czech Republic's parking system, and global digital services.

For Aspiring Designers & UX Enthusiasts

For those entering the field of UX/UI design, this study serves as a practical guide to the psychology of digital experiences.

Prioritize User-Centered Design: Always start with usability—intuitive navigation, clear layouts, and minimal cognitive load. Aesthetic appeal should enhance, not hinder, functionality.

Leverage Color Psychology: Understand how colors influence user emotions and behavior. Blue tones build trust, while poor contrast can create frustration.

Emphasize Accessibility: Inclusive design ensures broader engagement. Proper contrast, readable fonts, and functional multilingual support are essential for seamless experiences.

Test & Iterate: Use A/B testing, heatmaps, and real-world feedback to refine interfaces. A well-designed system evolves based on actual user interactions.

For the Czech Republic's Parking System

To enhance usability and engagement, fundamental improvements are necessary in navigation, transparency, and accessibility.

Simplify the User Flow: Reduce unnecessary steps in the registration and payment process to minimize frustration. Estonia's 7-step approach proved significantly more efficient.

Enhance Transparency: Display parking availability and pricing **before** users proceed with registration to build trust. Hidden information leads to lower engagement.

Improve Accessibility & Language Support: Ensure all language options function properly and optimize the system for visually impaired users by improving contrast and readability.

Upgrade Technical Infrastructure: Address reported technical failures and slow response times through enhanced backend optimization and regular usability audits.

For Government Digital Services & Private Digital Platforms

The principles identified in this research apply not only to parking systems but to all digital services that rely on user engagement and trust.

Adopt a Mobile-First Approach: With 72% of users accessing the parking system via mobile, ensuring a seamless, responsive mobile experience should be a priority.
Integrate AI for Personalization & Efficiency: Smart features, such as AI-driven navigation assistance and predictive analytics, can enhance user convenience.
Ensure Transparency & User Control: Clearly display critical information upfront—hidden fees or unclear processes erode trust and discourage engagement.
Standardize Accessibility Guidelines Across Platforms: Governments and service providers should enforce universal UX and accessibility standards (e.g., WCAG, ISO 9241) to ensure inclusivity.

Final Thought

Good digital design is not just about aesthetics—it is about creating intuitive, stress-free, and engaging user experiences. Whether in government services or private platforms, a thoughtfully designed system can improve efficiency, accessibility, and user satisfaction, making digital interactions seamless for all.

Recommendations for Future Research

While this study provided valuable insights, several areas warrant further exploration.

Emotional Design Impact:
Investigate how specific design elements, such as animations or transitions, influence user emotions and trust.

Longitudinal Studies:
Explore how user satisfaction evolves over time with system updates and redesigns.

Comparative Studies Across Sectors:
Extend the scope to other governmental services, such as healthcare or tax platforms, to generalize findings.

6 Conclusion

In an era where digital interfaces have become the gateways to essential services, the design of these systems holds the power to shape user satisfaction, trust, and engagement. This thesis explored the intricate relationship between digital design, psychology, and user behavior, with a focus on governmental parking systems in the Czech Republic and Estonia. By integrating theoretical insights with practical analysis, the study illuminated how design elements can significantly influence user experiences and broader societal trust in digital government platforms.

The Transformative Role of Digital Design

The findings of this research highlight the undeniable impact of thoughtful, user-centric design. Estonia's parking system serves as a benchmark for excellence, demonstrating how simplicity, transparency, and accessibility can foster positive emotional responses and seamless user journeys. In contrast, the challenges identified in the Czech Republic's system underscore the cost of neglecting usability, inclusivity, and transparency. These contrasting outcomes offer not only a comparative perspective but also actionable lessons for digital government systems worldwide.

Bridging Theory and Practice

The comparative analysis highlighted how theoretical concepts materialize in real-world applications:
Estonia's success demonstrated the practical impact of prioritizing **usability, emotional design, and transparency**.
The Czech Republic's challenges revealed gaps where theory was not adequately implemented, such as in visual accessibility and process simplicity.

Implications for Digital Government Services

The implications of this study extend far beyond parking systems. Digital governmental platforms are not mere transactional tools—they are symbols of institutional trust and efficiency. Applying the principles discussed in this research, governments can create systems that:
Reduce stress through **user-friendly processes**.
Build trust with **transparent and accessible designs**.
Enhance satisfaction by incorporating **inclusive features** and fostering positive emotional engagement.

A Call for User-Centric Design

At the heart of these findings is a clear message: user-centric design is not optional; it is essential. Governments must adopt a proactive approach to designing digital services that prioritize the needs, behaviors, and expectations of their citizens. This involves embracing accessibility standards, fostering transparency, and integrating user feedback at every stage of the design process.

Looking Ahead: The Future of Digital Design

As technology continues to evolve, the opportunities for enhancing digital government services are boundless. Emerging technologies such as artificial intelligence, machine learning, and augmented reality hold the potential to further personalize and optimize user experiences. However, the core principles of user-centricity, inclusivity, and trust must remain at the forefront of these innovations.

Final Reflection

This thesis has shown that the intersection of psychology, health, and digital design is not just a theoretical concept but a practical reality that shapes everyday interactions. By understanding and applying the dynamics explored in this research (the principles of **Color Psychology**, **Visual Hierarchy**, **Emotional Design**, and **Accessibility**), governments can transform their digital platforms into powerful tools that enhance user satisfaction, improve public trust, and create a more connected and equitable digital society.

Keywords for the Conclusion:

- User-centric design
- Emotional engagement
- Accessibility and inclusivity
- Trust and transparency
- Future of digital government services

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8 List of pictures, tables, graphs and abbreviations

8.1 List of pictures

8.2 List of tables

8.3 List of graphs

Appendix

Appendix A: User Surveys

Survey 1: User Experience with Parking Systems

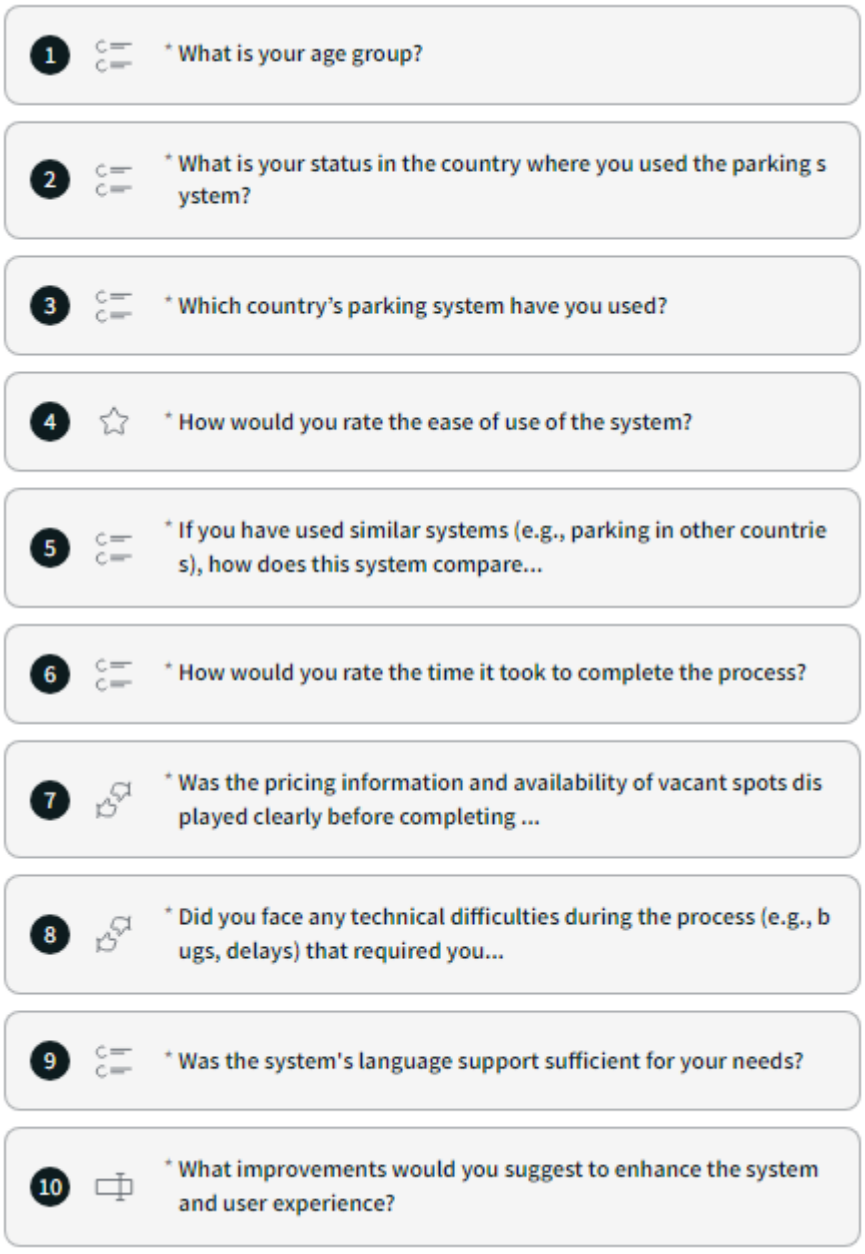

Figure 15 Survey 1

Survey 2: Design and Impact of Parking Systems

Figure 16 Survey 2

Appendix B: Interview Questions

Questions for Regular Users:

1. How easy was it for you to use the parking system for the first time?
2. Do you think the system provides clear instructions and is easy to navigate? Why or why not?
3. If you could change one thing about the parking system, what would it be?

Questions for Web Designers:

1- Interview 1: Web Designer at VZP, Prague

1. How do you balance aesthetics with functionality in your designs?
2. Why do you think Estonia's parking system is more user-friendly compared to the Czech system?
3. Do you think the Czech and Estonian parking systems meet global accessibility standards? Why or why not?
4. How do design elements like colors and layout influence users' emotions and trust? reduce stress and enhance user satisfaction?
5. The survey showed that 61.54% of users in the Czech Republic experienced technical issues, compared to 0% in Estonia. In your opinion, what could cause such a discrepancy?
6. 23.08% of Czech users said the process took too long. How do you think the system's design contributes to this delay?
7. Why do you think 50% of Czech users rated the color scheme as "Fair" or lower, while 81.82% of Estonian users rated the visual design as "Excellent"? Could this be due to aesthetic preferences, or specific design principles?
8. 90.91% of Estonian users reported feeling "Very Happy," compared to 16.76% in the Czech Republic. How do you think design influences these emotional differences?
9. Looking at the overall results, what do you think is the most critical change needed to improve the Czech system's performance?
10. What are your top recommendations for improving the Czech Republic's parking system?

2- Interview 2: Web Designer for Dubai's Government Parking System

1. What was your role in designing Dubai's government parking system?
2. What were the biggest challenges you faced in designing the system, and how did you overcome them?
3. How did you balance usability and aesthetics to ensure a smooth user experience?
4. What technologies or frameworks were used to develop the parking system?
5. How did you optimize the system for mobile users?
6. How does the system integrate with other smart city services in Dubai?
7. How do you ensure the system is accessible to all users, including tourists and non-Arabic speakers?
8. How does Dubai's parking system compare to those in other countries like Estonia or the Czech Republic?
9. What metrics or user feedback do you rely on to evaluate the system's success?
10. If you had the chance to improve the system further, what would be your top recommendations?