Impact of Demographics and User Personas on GUI Development

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Abstract—**This paper studies how personas influence the design of graphical user interfaces. We present a survey-based analysis, describe methodology, and discuss implications for software engineers. The results indicate that persona-driven design improves usability and user satisfaction. Throughout this paper, Netflix serves as a case example to illustrate GUI design decisions.**

Index Terms—**Graphical User Interface (GUI), User-Centered Design, Personas, User Experience (UX), Software Engineering**

I. INTRODUCTION

In a market as competitive as the software market, where variables such as geolocation or scalability no longer represent major challenges, focusing on building a truly high-quality product is more crucial than ever before.

Every product, whether software or not, has three main components: **functionality**, **aesthetics** and **usability**. Functionality refers to the features and capabilities that the product offers to its users. Aesthetics refer to the visual appeal and design of the product, including elements such as color schemes, typography, and overall layout. Meanwhile, usability refers to how easy and intuitive it is for users to use the product. Together, these three factors drive user attraction and satisfaction.

Two of these elements - aesthetics and practicality - are part of what we call a **Graphical User Interface** (GUI). GUI development involves more than just designing a pretty interface, but rather creating a bridge between the offered functionality and the user. Therefore, an effective GUI must be both visually appealing and highly intuitive, making it easy for users to accomplish tasks.

Netflix, for example, would likely not be as successful if a user, in order to watch a movie, had to rely on a text-based, black-and-white terminal rather than a clean, well-designed website with menus and icons.

As its name already implies, a GUI is very **user-centered**. As always in business, it is all about the user. A GUI must be designed with the end user in mind. The more a GUI is tailored to it's target audience, the more effective it will be.

To understand our customer base we use demographics and personas
allow to understand the user based on a set of traits
to assign to each user a set of attributes that help to better understand the user and his/her needs. While demographics usually refer to statistical data about a population, personas are fictional characters that represent different user types within a targeted demographic.

refer to a multitude of distinct user characteristics that we consider relevant and have an impact on the tailoring of our GUI. The main categories of these characteristics are:

- **User profile data**, e.g. demographics (age, gender, education level), preferences
- **Activity**, e.g. frequency of use, types of tasks performed, and interaction patterns
- **Environment**, e.g. device properties, legal requirements

Some of these attributes might be demographic factors (age, gender, education), psychographic characteristics (preferences, cultural background), and cognitive capabilities.

The development of a GUI is a very complex process that involves almost infinitely many variables.

There are many factors that make of a GUI a great GUI, e.g. modern and consistent design, intuitiveness, quickness of an action, etc.

Most of these factors are quite measurable, e.g. we could do some statistical test.

Understanding the end user is crucial for creating effective, usable and captivating graphical user interfaces.

A. Subtitle

Placeholder

II. IMPACT ON DESIGN

III. DEMOGRAPHICS VS. PERSONAS

Firstly it is important to distinguish these two terms, since Demographics and user personas capture two complementary perspectives on users in GUI development.
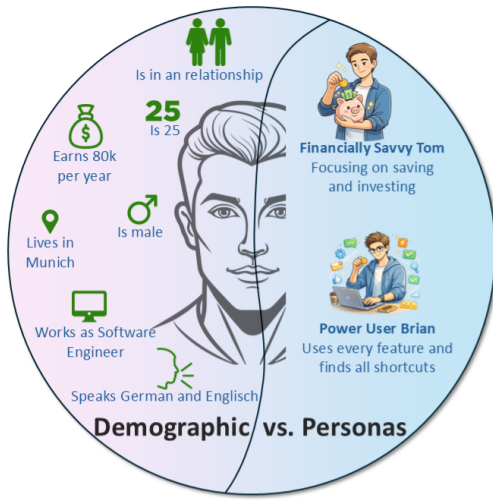
Fig. 1. Demographics provide population-level constraints, while personas capture goals, tasks, and usage context. (Grphic inspired by [TODO])

Demographics provide a population-level view that is grounded in observable facts. Attributes such as age, abilities, cultural background, and prior experience reveal systematic differences in perception, motor skills, cognitive load, and typical usage situations [1]–[5]. This evidence is essential for defining baseline requirements for usability and accessibility, for example regarding font sizes, color contrast, input modalities, or supported services. Several guidelines and standards, such as the Web Content Accessibility Guidelines (WCAG) and platform-specific human interface guidelines, explicitly build on such demographic and accessibility considerations to derive concrete design recommendations. However, demographic categories like "65+" or "visually impaired" remain coarse, as they do not specify concrete goals, everyday tasks, or the actual usage context of a system.

Personas are used to translate such abstract differences into concrete user archetypes that describe typical goals, tasks, and contexts of a target group [6]. They help teams design for specific needs instead of an undefined "average user" and provide a shared reference for design decisions. However, personas are frequently criticized when they are created without empirical grounding and instead rely on stereotypes or personal assumptions [7].

Combining both perspectives mitigates these limitations. Demographic evidence can ground personas by ensuring that relevant constraints and user groups are covered, while personas operationalize demographic insights into concrete scenarios and design implications [2], [3], [8]. In this way, demographics define the breadth and diversity of the user population, and personas turn this breadth into actionable guidance for GUI design.

IV. Impact of Demographics on GUI Design

A. Country- and Region-Specific Requirements

B. Age and Life Stage

C. Cultural Differences

D. Disabilities and Accessibility Needs

V. Impact of Personas on GUI Design

A. Persona-Driven Adaptation to Context (Mobile vs. Desktop)

B. Limitations and Challenges of Persona Use

VI. Impact of Artificial Intelligence in GUI Development

A. AI-Assisted Development for Persona- and Demographic-Aware GUIs

- **Embedding personas and demographics into prompts:**
  - AI coding assistants can be guided with explicit information about target personas (e.g., novice vs. expert users) and demographic constraints (e.g., older adults, users with visual impairments).
  - When prompts include these aspects, generated GUI code is more likely to reflect appropriate interaction complexity, font sizes, contrast, or navigation depth for the intended user groups.

- **Operationalizing persona and demographic requirements in code:**
  - AI can help translate high-level persona descriptions (goals, tasks, context) into concrete UI elements and interaction flows (e.g., simplified wizards for infrequent users, shortcut-heavy views for experts).
  - Demographic evidence (e.g., accessibility guidelines, age-related constraints) can be referenced explicitly in prompts so that the assistant proposes components that follow these constraints.

- **Risk of generic, persona-blind suggestions:**
  - Without explicit persona and demographic context, AI defaults to generic patterns that may primarily fit "average" or highly experienced users.
  - This can unintentionally marginalize critical user segments, such as older users or people with disabilities, even if personas for these groups exist in the project.

B. Vibe Coding and the Role of Personas and Demographics

- **Vibe coding with persona-aware prompts:**
  - During exploratory "vibe coding", developers can incorporate persona labels (e.g., "design this view for an anxious first-time user") and demographic cues (e.g., "suitable for low-vision users on mobile") directly in natural-language prompts.
  - This keeps rapid prototyping aligned with the defined user models instead of drifting towards purely aesthetic or developer-centric preferences.

- **Danger of drifting away from user models:**

- If vibe coding relies only on generic prompts like "modern dashboard" or "clean settings page", AI-generated GUIs may ignore the specific needs of the personas and demographic groups identified earlier in the project.
- Such drift makes it harder to justify design decisions with respect to user diversity and may contradict accessibility and inclusion goals.

C. Limitations of AI for Persona- and Demographic-Sensitive GUIs

- **Lack of embedded user models:**
  - Current AI tools do not maintain an internal, project-specific model of personas or demographic segments; they only react to what is stated in the prompt or visible in the code.
  - As a result, persona and demographic considerations can easily be lost once they are not explicitly mentioned in each interaction.
- **Inconsistent alignment with guidelines:**
  - Even when accessibility or demographic constraints are mentioned, AI suggestions may only partially follow relevant guidelines (e.g., WCAG) and still require manual review against persona and demographic requirements.
  - Over-reliance on AI-generated code increases the risk that subtle needs of certain personas (e.g., low digital literacy, anxiety, motor limitations) are overlooked.

VII. USER EXPERIENCE

VIII. CONCLUSION

Section reference **??**

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TODO: - Vibe coding - Impact of user-tailored GUI on the code