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Research Title: Evaluating UX and Accessibility in Mobile Dashboards

Evaluating UX and Accessibility in Mobile Dashboards

❖ Problem Statement:

Mobile dashboards are designed to make complex data easy to understand on the go. However, squeezing dense charts, real-time metrics, and navigation menus into a small screen often creates a major usability bottleneck. For users with visual, cognitive, or motor impairments, this layout challenges the compound instantly.

❖ Research Objectives:

➤ General Objective:

The primary objective of this study is to design a comprehensive framework for evaluating mobile BI dashboards, specifically addressing the friction between complex data visualization, cognitive strain, and digital accessibility compliance.

➤ Specific Objectives

To achieve this primary goal, the study will address the following specific objectives:

- **Identify UI Catalysts for Cognitive Fatigue:** Isolate specific visual layout elements such as complex 3D charts or unannounced dynamic data updates that contribute to cognitive overload and diminish user decision-making accuracy.
- **Evaluate Assistive Technology Interoperability:** Analyse how screen readers interact with mobile dashboards, focusing on how systemic issues like missing alternative text and illogical focus orders compromise user autonomy.
- **Develop a Hybrid Quality Assurance Workflow:** Establish a testing pipeline that integrates automated code scans with manual usability evaluations, embedding accessibility checks directly into the standard software development lifecycle rather than treating them as a post-development compliance step.
- **Formulate a Defect Triage Matrix:** Design a practical severity matrix to categorize and rank interface design defects, enabling development teams to efficiently prioritize critical screen reader and usability bugs within extensive error logs.
- **Validate the Framework via Field Testing:** Validate the proposed evaluation framework through a mixed-methods field study, correlating quantitative performance metrics (e.g., task completion times, error rates) with qualitative user feedback under simulated workplace distractions.

➤ Existing Solutions and the Problem

Right now, current solutions are split and incomplete. Companies usually rely on basic design checklists, which completely ignore the real-world distractions and

stress that an actual user faces. On the other hand, academic researchers use sterile laboratory studies (like eye-tracking) that don't match reality like trying to use an app on a moving train or in a noisy office. Plus, development teams keep accessibility testing separate from their main software pipelines.

❖ **The Data Density Paradox**

This gap leaves us with a major contradiction, which we call the "*Data Density Paradox*":

- **What design rules say:** Keep screens as simple as possible so users don't get overwhelmed.
- **What users need:** In the real world, professional users get frustrated with overly simple layouts. They need deep, detailed data to make important, high-stakes business decisions.

❖ **Why This Research Matters**

Because no single method currently connects these conflicting needs, we need a new approach. This research creates a straightforward framework that balances rich data density, mental workload, and practical accessibility testing directly inside the normal software development process.

❖ **Data Analysis and Evaluation**

➤ **Analytical Comparison:**

- **Application to Research:** We will use statistical analysis to compare user performance data specifically task completion times and error rates between standard, unoptimized industry dashboards and dashboards redesigned using our new framework. Additionally, we will mathematically measure the exact difference in how many accessibility bugs are caught by standalone automated tools versus manual expert reviews.

➤ **Trade-off Analysis:**

- **Application to Research:** To solve the "*Data Density Paradox*," we will analyse the balance between showing detailed, high-dimensional data and overloading a user's memory. By comparing subjective mental fatigue scores (measured via NASA-TLX surveys) with actual user decision accuracy, this study will find the exact tipping point: how much data we can pack onto a small screen before user performance and accuracy begin to drop.

➤ **Formulating Recommendations:**

- **Application to Research:** Finally, we will turn our comparative and trade-off data into practical engineering guidelines for mobile software development teams. These recommendations will provide concrete design patterns for building data-

heavy mobile charts, setting intuitive screen reader navigation paths, and embedding automated accessibility checks directly into standard software deployment (CI/CD) pipelines.

➤ Why This Research Matters

As enterprise workflows rapidly shift to mobile devices, corporate software is hitting a critical breaking point. Two distinct problems are currently colliding on mobile screens:

- **The Overload Problem:** Modern professionals require deep, granular data to make high-stakes business decisions. However, cramming dense datasets onto a smartphone screen causes severe cognitive fatigue. This mental strain can lead to a half of drop in decision-making accuracy, meaning poorly designed dashboards are actively draining corporate productivity and capital.
- **The Exclusion Problem:** Accessibility remains an afterthought in enterprise software engineering. Because standard automated scanning tools cannot interpret visual logic, they fail to catch 55% of accessibility defects. Consequently, millions of professionals with visual, motor, or cognitive impairments are effectively locked out of essential corporate data tools simply due to missing alternative text or broken screen reader navigation paths.

➤ Who Can Solve It?

This problem cannot be solved by a single person; it requires a unified approach from three specific groups in the software eco-system:

- **UI/UX Designers:** They can solve the "*Data Density Paradox*" by using the framework's Trade-off Analysis to design layouts that present deep data granularity without exceeding human cognitive limits or causing visual fatigue.
- **Mobile Software Engineers:** They are the ones who build the actual code. By using the framework's *Error-Prioritization Matrix*, they can fix critical screen reader and layout bugs systematically without getting overwhelmed by chaotic error logs.
- **DevOps & QA Teams:** They can solve the structural isolation of accessibility by taking the framework's *Hybrid Engineering Pipeline* and embedding automated scans alongside manual human testing directly into the core *CI/CD deployment pipelines*.

➤ References

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