

# T-13 Optimizing UX and UI with Ergonomics-centric Design Presenter: Javed Anjum Sheikh, TUTORIAL GROUP C • 10:00 - 12:00 (CEST)

15th International Conference on Applied Human Factors and Ergonomics (AHFE 2024) and the Affiliated Conferences





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# My background ...at a glance

- 22+ years of Teaching, Research & Managerial Experience (UK, Malaysia, & Pakistan)
- Founding Campus Director, University of Lahore, Gujrat Campus
- Founding Director, Faculty of Computing & IT, University of Sialkot
- **25+** Conference papers
- Organized two International Conferences, 2015 & 2016
- Conducting Tutorials in International Conference (AHFE) since 2016
- £ 150,000+ *Funded projects* (UK, Malaysia, and Pakistan).

PhD	Middlesex University, UK	Human-Computer Interaction
MSc	University of Huddersfield, UK	Software Development
MBA	Adamson University, Philippine	MIS
MLIS	University of Karachi, Pakistan	Academic Information System

# INTRODUCTION

Definition and Importance of Ergon Relevance to UX and UI

Key Ergonomic Principles for UX/UI Fitts's Law Application in UI Design

> Hick's Law Application in UI Design

**Consistency and Predictability** Application in UI Design



# INTRODUCTION

## **Applying Ergonomic Principles to Design**

**Design for Diverse Users** 

**Adapt for Multiple Devices** 

**Intuitive Navigation and Feedback** 

Importance of Testing and Iteration Usability Testing Methods Purpose Iterative Design Process Outcome



# **UNDERSTANDING THE BASICS OF UX**

## User Experience (UX)

... with a product focusing on Usability, efficiency, and Satisfaction

#### **Focus Areas:**

**Usability:** 

How easy and intuitive it is to use the product.

**Efficiency:** 

How quickly and effectively users can achieve their goals. **Satisfaction:** 

How pleasant and fulfilling the user finds the experience.

Why UX Matters:

Directly impacts user retention and engagement.



# **UNDERSTANDING THE BASICS OF UI**

## <mark>User Interface (UI)</mark>

The visual elements to interacts with a product.

**Components:** 

**Buttons:** 

Elements that users click to perform actions. **Icons:** 

Visual representations of actions.

**Menus:** 

Lists of options or commands presented to the user.

## **Why UI Matters:** Creates the first impression of the product.



# **INTEGRATION OF UX AND UI**

## **Working Together:**

UX and UI must work together to create a seamless, enjoyable experience for the user. UX is about **how it feels**, while UI is about the **look and interactivity**.



# WHAT IS ERGONOMICS?

...designing equipment that fit the human body, its movements, and cognitive abilities.

## **Key Principles:**

**Comfort:** Ensuring that users can interact with the interface without physical strain.

#### **Efficiency:**

Designing interfaces that allow users to perform tasks quickly and easily.

#### User Satisfaction:

Creating a pleasant user experience that meets user needs and expectations



# **IMPORTANCE**

Good ergonomic design improves comfort, reduces the risk of injury, and enhances performance

#### **Importance in Design:**

Ergonomics helps create interfaces that reduce strain and fatigue, improving user satisfaction and productivity.

## **Examples of Ergonomic Design:**

Real-world examples like office chairs, keyboards, and mobile apps that showcase ergonomic principles.



# **TYPES OF ERGONOMICS IN DESIGN**

#### **Cognitive Ergonomics:**

Perception, Memory, Reasoning, and Motor Response.

**Example:** tasks by breaking them into smaller steps.



#### UNDERSTANDING DIFFERENT TYPES OF ERGONOMICS IN DESIGN

## **Physical Ergonomics:**

Posture, Manual Handling, and Repetitive Movements.

#### **Example:**

to Accommodate Different Hand Sizes and Reduce Strain.



Organisational ergonomics is concerned with the optimisation of socio-technical systems, including their organisational structures, policies and processes.

C Bandy Gladesman

**Organizational Ergonomics:** Better Interaction and Productivity

**Example:** to Reduce Cognitive Load.



Enhancing User Comfort and Productivity Improves Comfort Adjustable Chairs and Desks: Promoting Better Posture: Boosts Productivity Ergonomic Keyboards and Mice: Optimized Workspace Setup:





SDADI 2 Inches Carpet Wheels Mobile Standing Desk Stand Up Desk Height Adjustable Home Office Desk with Standing and Seating 2 Modes 3.0 Edition, Dark Grain

## **Reducing Errors and Increasing Satisfaction**

...reduce user errors and increase user satisfaction by making interfaces user-friendly.

#### **Reducing Errors**

- **Clear Labeling:** Each function is easily identifiable, to reduce the chance of errors.
- Logical Placement of Controls: Controls align with users' expectations.
- **Consistency in Design:** A consistent layout helps users learn and predict actions

#### Increasing Satisfaction

- **Immediate Feedback:** Provides visual or auditory confirmation of user actions, helping users feel confident that their actions have been registered correctly.
- **Visual Cues:** Use of animations, color changes, or other visual indicators to guide users and confirm their actions.
- **Streamlined Workflows:** Designing interfaces that align with user tasks and goals, minimizing unnecessary steps and making processes more efficient.

## Adapting to Diverse User Capabilities

Users with physical/cognitive abilities to create inclusive and accessible interfaces.

#### a. Physical and Cognitive Diversity

**Physical Abilities:** Mobility, dexterity, and sensory capabilities, (visual or auditory) **Cognitive Skills:** Cognitive abilities, affect how they process information and interact

**Examples: Adjustable Screen Brightness and Text Size:** To customize their viewing experience

**Simplified Interfaces:** To reduce complexity and make navigation intuitive



#### b. Adaptive Features

- *Voice Commands:* Allow hands-free operation, beneficial for users with mobility impairments who may have difficulty using traditional input devices.
- *Screen Readers:* Convert text to speech, aiding visually impaired users in navigating interfaces by reading out text and providing audio feedback.



## c. Inclusive Design

*Voice Controls:* Facilitate hands-free operation for users with limited hand mobility, making interactions more accessible and convenient.

**Tactile Feedback:** Provides haptic responses for visually impaired users, enhancing their interaction with touch interfaces by giving physical feedback on actions.



## Consistency and Predictability in UI/UX Design

Consistent interfaces ensure users understand and anticipate system responses.

#### **1.Consistency in Design Patterns**

Uniform buttons and navigation bars etc. across different screens or applications. *2.Predictable Interactions* 

Interfaces where actions and outcomes follow logical and expected patterns.

#### **3.**Application Example: Microsoft Office

**Overview:** 

Microsoft Office maintains a consistent toolbar like Word, Excel, and PowerPoint. **Benefit:** 

Users transfer knowledge seamlessly between applications, reducing the learning curve and improving efficiency.

#### **Impact**:

Enhances productivity and reduces errors in complex tasks

## Touch Target Sizes and Spacing in UI/UX Design

Touch target sizes & spacing in design to improve accessibility and UX.

#### **1.Introduction to Touch Target Sizes and Spacing**

Touch targets & sizing/spacing prevent usability issues & enhance accessibility. *2.Explanation of Adequate Size for Touch Targets* 

Ensuring buttons & interactive elements are large enough for comfortable tapping. **3.Explanation of Proper Spacing Between Interactive Elements** 

Enough space b/w touch targets to prevent accidental taps and improve usability. *4.Application Example: Spotify App* 

The Spotify app utilizes spacious and appropriately sized buttons for playback controls and navigation.

Users navigate and control music playback without accidental taps.

Enhances user experience by improving accessibility and usability on mobile devices

## Real-World Applications of Ergonomic Design

In design, showcasing their impact on user satisfaction, productivity, & error reduction.

#### Introduction to Ergonomic Design

To enhance user interaction by reducing physical and cognitive strain.

#### **Case Studies of Successful Integration**

#### Apple:

Emphasizes intuitive navigation and accessibility in macOS and iOS. Microsoft:

Consistent interface design and accessibility tools in Microsoft Office.

#### **Google:**

Minimalist interfaces in products like Google Search.

#### **User Feedback and Testimonials**

Users report increased comfort, efficiency, and satisfaction.

## WHY ERGONOMICS MATTERS IN UX/UI DESIGN Best Practices for Integrating Ergonomics

#### **1.Introduction to Ergonomic Design Principles**

Design focuses on user interaction by reducing physical and cognitive strain. *2.Design Tips* 

*Consistency:* Uniform design to enhance user familiarity & reduce cognitive load. *Feedback:* Provide clear and immediate responses to interaction confirmation. *Simplification:* Streamline navigation to minimize confusion

#### **3.Tools and Resources**

Usability Testing Tools: Utilize tools to gather user data and refine designs.
Ergonomic Guidelines: Interfaces meet diverse user needs and ergonomic standard
Accessibility Standards: Adhere to accessibility guidelines for users with disabilitie
4.Common Pitfalls to Avoid

*Neglecting User Feedback:* Incorporate user feedback to improve usability. *Complexity:* Avoid complicated interfaces *Accessibility Oversight:* Ensure interfaces are accessible to users with disabilities

# FITTS'S LAW IN UI/UX DESIGN

## Fitts's Law

#### **Explanation of Fitts's Law**

The time required to move to a target area depends on the distance and size of the target. Therefore making interactive elements improved usability.

#### Application in UI/UX Design

Large Buttons and Interactive Elements:

To design interactive elements with sufficient size to facilitate easy clicking. *Placement of Frequently Used Buttons:* 

Ensuring buttons are positioned within easy reach of the user's natural movement.

#### Example: Netflix App

*Overview:* The Netflix app features large, easy-to-tap buttons for navigation. *Benefit:* Users can navigate with minimal effort and reduced navigation time. *Impact:* Enhances user experience by reducing cognitive load.

# **KEY PRINCIPLES OF ERGONOMICS IN UX/UI DESIGN**

## Hick's Law in UI/UX Design

Reducing complexity can alleviate cognitive load and user decision-making efficiency.

#### Application in UI/UX Design

Simplified Menus and Options:

Streamlined menus and clear navigation paths to reduce decision-making steps. *Clear Categorization and Minimalism:* 

Content into distinct categories & employing minimalist design to enhance clarity. *Example: Google's Homepage* 

Overview:

Homepage exemplifies with its minimalist design around a single search bar. *Benefit:* 

Users can quickly initiate searches without distraction.

Impact:

Enhances usability by minimizing decision-making time and cognitive load

# **CASE STUDY INTRODUCTION**

## Designing with Ergonomics in Mind

Diverse needs of users, such as the elderly, children, or users with disabilities, and designing interfaces that cater to their specific requirements.

*Elderly Users:* Larger text/buttons, and navigation for declining vision and dexterity. *Children:* Require intuitive navigation, engaging visuals for better interaction.

#### **Adapting Designs for Various Devices**

*Responsive Design:* Adjusts layout and content to fit various screen sizes. *Adaptive Interfaces:* Tailor elements for mobile devices or mouse-friendly designs.

#### **Ergonomic Guidelines and Standards**

Familiarizing with established guidelines, to ensure practices in ergonomic design.

**Apple's Human Interface Guidelines:** Provides principles for iOS and macOS

**Google's Material Design:** To create consistent & visually appealing Android apps.

## CASE STUDY 1: ANALYZING POPULAR APPLICATIONS (MODULE 1)

**Objective:** The application of ergonomic principles in real-world applications. Application Analysis:

**Application: Instagram:** Identify ergonomic features in Instagram: *Easy Navigation:* 

The bottom navigation bar, clear labels, and consistent icons.

Clear Visual Hierarchy:

Analyze the organization of content, typography, color contrast, and spacing *Responsive Design Elements:* 

Comparison: Highlight differences in: Touch Targets: Compare the size and spacing of touchable elements. Navigation Ease: Evaluate the simplicity and predictability of navigation. Visual Clarity: Assess the visual layout for readability and effective information conveyance.

## CASE STUDY 1: ANALYZING POPULAR APPLICATIONS (MODULE 1)

#### **1.Group Discussion:**

Task:

Form groups to discuss your findings from the application analysis. Highlight key ergonomic features and their impact on user experience.

#### **2.Presentation:**

Task:

Each group presents their analysis to the entire class.



CASE STUDY 2: CREATING AN ERGONOMIC UI MOCKUP (MODULE 2)

**Objective:** Apply ergonomic principles in designing a UI mockup.

#### **1.Design Task:**

Assigned Project: Hypothetical to-do list app. Task: Create a UI mockup for the to-do list app based on ergonomic principles.

#### **2.Peer Review:**

**Task:** Pair up participants to exchange designs. Review each other's mockups, Provide constructive feedback, and suggest improvements.

#### **3.Refinement:**

Task: Participants refine their designs based on the feedback received.

# CASE STUDY 3: USABILITY TESTING (MODULE 3)

**Objective:** Identify and improve ergonomic issues through usability testing.

#### **1.Usability Testing Task:**

Assigned Interface: Sample e-commerce website prototype. Task: Conduct usability testing in small groups, with members taking turns as testers & observers. Note ergonomic issues.

#### **2.Documentation:**

Task: Document findings, focusing on key ergonomic issues. Each group will propose ergonomic improvements based on the test results.

#### **3.Presentation:**

Task: Groups present their findings and propose improvements

CASE STUDY 4: REDESIGNING FOR ACCESSIBILITY (MODULE 4)

**Objective:** Improve accessibility of an existing interface

#### **1.Redesign** Task:

Assigned Interface: Simple blog or news website. Task: Redesign the website to enhance accessibility (using tools like WAVE or Axe.) Make adjustments to improve readability, navigation, and overall accessibility.

#### **2.Group Discussion:**

Task: Groups share their redesigned interfaces. Discuss the accessibility improvements made and the challenges faced during the process.

CASE STUDY 5: DESIGNING A MOBILE APP INTERFACE (MODULE 5)

**Objective:** Optimize a mobile app interface for ergonomic use.

#### **1.Design Task:**

Assigned Project: Hypothetical fitness tracker app. Task: Design a mobile app interface with a focus on ergonomic principles. Test the design on different devices and screen sizes to ensure usability.

#### **2.Group Presentation:**

**Task:** Groups present their mobile app designs to the entire class. Gather feedback and make improvements based on ergonomic considerations.



#### CASE STUDY 6: IMPLEMENTING ADVANCED ERGONOMIC TECHNIQUES (MODULE 6)

**Objective:** Explore and apply advanced ergonomic techniques in UI design.

#### **1.Implementation Task:**

Assigned Interface: Pick any web page or app interface. Task: Implement ergonomic techniques (e.g., use simulated eye-tracking data) to refine the layout and navigation. Analyze the impact on UX.

#### **2.Documentation:**

**Task:** Document the implementation process and results. Present findings, highlighting improvements made through advanced techniques.

CASE STUDY 7: COMPREHENSIVE DESIGN PROJECT (MODULE 7) Objective: Present UI/UX design project incorporating ergonomic principles

#### **1.Individual Project Work:**

Task: Create a comprehensive UI/UX design project incorporating ergonomic principles learned throughout the course. Prepare to explain design choices and ergonomic considerations.

#### **2.Project Presentation:**

Task: Each participant presents their project to the class. Receive and provide feedback during peer review.

#### **3.Reflection:**

Task: Reflect on the learning process & the importance of ergonomics in UI/UX design. Discuss future applications of ergonomic principles in their projects.

## **CODE EXAMPLES AND HANDS-ON EXERCISE INSTRUCTIONS**

## **Original Form**

#### <form>

```
<label for="name">Name:</label>
```

```
<input type="text" id="name" name="name"><br>
```

```
<label for="email">Email:</label>
```

<input type="text" id="email" name="email"><br>

<label for="dob">Date of Birth:</label>

<input type="date" id="dob" name="dob"><br>

<input type="submit" value="Submit">

</form>

Login	Signup
mail	Email
assword č	Create password
Forgot password?	Confirm password
Login	Signup
Don't have an account? Signup	Already have an account? Login
Or	Or
f Login with Facebook	f Login with Facebook
Login with Google	G Login with Google

<form>

- <div style="margin-bottom: 10px;">
- <label for="name">Name:</label>
- <input type="text" id="name" name="name" style="width: 100%; padding: 8px;"></div>
- <div style="margin-bottom: 10px;">
- <label for="email">Email:</label>
- <input type="email" id="email" name="email" style="width: 100%; padding: 8px;"></div>
- <div style="margin-bottom: 10px;">
- <label for="dob">Date of Birth:</label>
- <input type="date" id="dob" name="dob" style="width: 100%; padding: 8px;"></div>
- <input type="submit" value="Submit" style="padding: 10px 20px; font-size: 16px;"></form>

# **MOBILE BANKING APP REDESIGN**

To Improve the UX of a mobile banking app through a redesign process.

## **Objective:**

To enhance user experience and efficiency of a mobile banking app. Addressing usability issues and implementing redesign improvements.



#### **REAL-WORLD EXAMPLE: A MOBILE BANKING APP**

#### **Identifying Original Interface Issues:**

#### **1.Small Touch Targets:**

- ✓ Users frequently missed the target.
- ✓ Increased task completion time and errors.

#### **2.Confusing Navigation Pathways:**

- ✓ Multiple nested menus.
- ✓ Unclear labels hindered finding key features.

#### **3.Poor Readability:**

- ✓ Text elements lacked contrast.
- ✓ Small fonts affected users with visual impairments.

#### **IMPLEMENTING REDESIGN IMPROVEMENTS:**

#### **1.Larger Buttons for Easy Tapping**

*Resized buttons to meet touch target guidelines:* 

Enlarging the buttons to meet the recommended sizes to reduce user errors.

*Increased spacing to prevent accidental taps*: Widening the gaps between buttons minimized unintentional touches, enhancing user accuracy.

*Resulted in reduced mis-taps and errors:* UX with fewer errors during interactions.

#### **2.Simplified Navigation**

*Implemented clear labels and reduced nested menus:* Clearer labeling & a reduction in nested menus simplified navigation, making it easier to find desired features.

*Improved accessibility of frequently used features:* By making frequently used features more accessible to streamlined workflows & improved overall usability.

A clearer, hierarchical structure with key features accessible from the home screen:

The prominent placement of key features on the home screen improved user efficiency. **3.Enhanced Readability** 

Adjusted text and background colors to meet accessibility standards for contrast: Color changes ensured sufficient contrast, enhancing readability for all users. Increased font sizes for better legibility: Larger font sizes improved readability. Readability improvements benefit all users: Contents are easier to read and understand

#### **EXPLANATION OF CHANGES:**

#### **Assessing the Impact on User Comfort and Efficiency**

#### **1.Reduced Error Rates**

Fewer navigation and interaction errors. Smoother user journey.

#### **2.Faster Task Completion**

Simplified navigation enabled quicker task completion.

#### **3.Increased User Satisfaction**

Higher satisfaction due to improved usability. Positive reviews and ratings



#### **STEP-BY-STEP INSTRUCTIONS FOR REDESIGN**

<style> body { font-size: 18px; line-height: 1.6; **color: #333;** font-family: Arial, sans-serif; label { font-weight: bold; </style>



<br/><button style="padding: 15px 25px;<br/>font-size: 18px; border-radius: 5px;<br/>background-color: #007BFF;<br/>color: white; border: none;<br/>cursor: pointer;">Submit</button>

#### **EXPLANATION OF CHANGES**:

<nav>

<a href="#home" style="padding: 10px 20px; text-decoration: none; color: #007BFF;">Home</a>

<a href="#services" style="padding: 10px 20px; text-decoration: none; color: #007BFF;">Services</a>

<a href="#contact" style="padding: 10px 20px; text-decoration: none; color: #007BFF;">Contact</a>

•The navigation bar uses flexbox to evenly distribute the navigation items.

- •List style is removed, and padding is set to 0 for a clean look.
  - •Links have padding to increase the touch target size.

•Text-decoration is removed, and a primary color (#007BFF) is used for the links to ensure they are easily recognizable as interactive elements.

## CONCLUSION

Importance of Ergonomic Principles in UX/UI Design **Enhancing Comfort and Usability Reducing User Strain Practical Strategies for Ergonomics-Centric Design Designing for Diverse User Needs Ensuring Device Adaptability Maintaining Intuitive Navigation** Value of Iteration and Usability Testing **Consistent Iteration Identifying Usability Issues Improving User-Centric Design Benefits of Ergonomics-Centric Design Increasing User Satisfaction Boosting Productivity Achieving Product Success Key Takeaways and Future Applications Gaining Valuable Insights Equipping Designers Enhancing User Experience** 





PLEASE REVIEW THE CASE STUDIES AND SUBMIT YOUR SOLUTIONS

# Sometimes questions are more important than answers

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