UI/UX

UI/UX		Semester	4
Course Code	BCS456C	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	14	Total Marks	100
Credits	01	Exam Hours	01
Examination type (SEE)	Theory (MCQ)		

Course objectives:

1. Understand user experience design requirements, with design goals, metrics and targets.
2. Explore different prototyping methods, UX design principles with case examples.
3. Understand the role of design thinking concepts and mental models in UX design.

Syllabus

- **Module1:**
  1. **Introduction:** Usability to user experience, Emotional impact as part of user experience, User experience needs a business case.
  2. **Extracting Interaction Design Requirements**: Needs & Requirements, Formal requirement extraction, Methods for requirement extraction.
- **Module2:**
  1. **Design Thinking, Ideation, and Sketching**: Design Thinking, Design Perspectives, User Personas, Ideation, Sketching.
  2. **Mental Models and Conceptual Design**: Storyboards, Design influencing user behaviour
- **Module3:**
  1. **Design Production**: Detailed Design, Wireframes.
  2. **UX Goals, Metrics and Targets**: UX Goals, UX Measures, Measurement instruments, UX Metrics.
- **Module4**:
  1. **Prototyping**: Depth & breadth of a prototype, Fidelity of prototypes, Paper prototypes.
  2. **Connections with Software Engineering**: Foundations for success in SE-UX development, The challenge of connecting SE and UX.
- **Module5**:
  - **UX Design Guidelines:** Using and interpreting design guidelines, Human memory limitations, UX design guidelines & examples, Planning, Translation, Physical action, Outcomes, Assessment, Overall.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

1. Explain the **user experience** design requirements.
2. Relate design thinking concepts and mental models to **UX design**.
3. Illustrate **UX design** in line with design goals, metrics and targets.
4. Demonstrate **different prototyping** in relation with software engineering.
5. Explain **UX design principles** with case examples.

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component (CCE) of the CIE, there are **25 marks** and for the Internal Assessment Test component, there are **25 marks**.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assessment methods like quiz/assignment/projects/practical assignment/programming assignment, etc will be considered.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of **Bloom's taxonomy** as per the outcome defined for the course

1. **Remembering:** Exhibit memory of previously learned material by recalling facts, terms, basic concepts,and answers.
2. **Understanding:** Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas
3. **Applying:** Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way
4. **Analyzing:** Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations.
5. **Evaluating**: Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.
6. **Creating**: Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.

What is UI/UX?

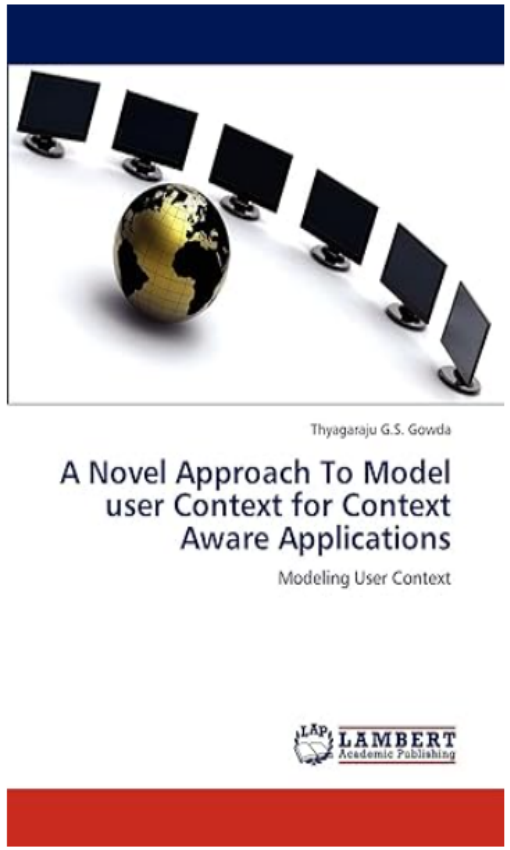
- UI/UX stands for **User Interface (UI)** and **User Experience (UX),** which are critical aspects of designing digital products like websites, mobile apps, software, and more.
- **UI (User Interface)** refers to the visual elements and components that allow users to interact with a digital product. It encompasses the **layout, typography, icons, buttons, menus, and other visual elements** that users see and interact with directly. The UI plays a crucial role in determining how a product looks and how users navigate through its features.
- **UX (User Experience**), on the other hand, is a broader concept that encompasses the **overall experience a user has while interacting** with a product. It encompasses not only the ***visual elements (UI) but also the usability, accessibility, performance, and overall satisfaction that the product provides***. UX design aims to create products that are intuitive, efficient, and enjoyable to use, considering the user's needs, goals, and behaviors.

Example1: E-commerce website like Amazon

- The **UI elements** would include the search bar, navigation menus, product images, buttons (like "Add to Cart" or "Buy Now"), and the overall layout of the website. These visual elements allow users to browse products, search for items, and complete purchases.

- **The UX,** however, encompasses the entire journey a user goes through when using the Amazon website. It includes factors like:
  - The **ease of navigation**,
  - The **clarity of product information**,
  - The **speed of loading pages**, the efficiency of the **checkout process**, and even the overall satisfaction and trust users have in the brand.

A good UX design ensures that users can find what they're **looking for quickly, complete their purchases smoothly**, and have an overall positive experience that encourages them to return to the website in the future.



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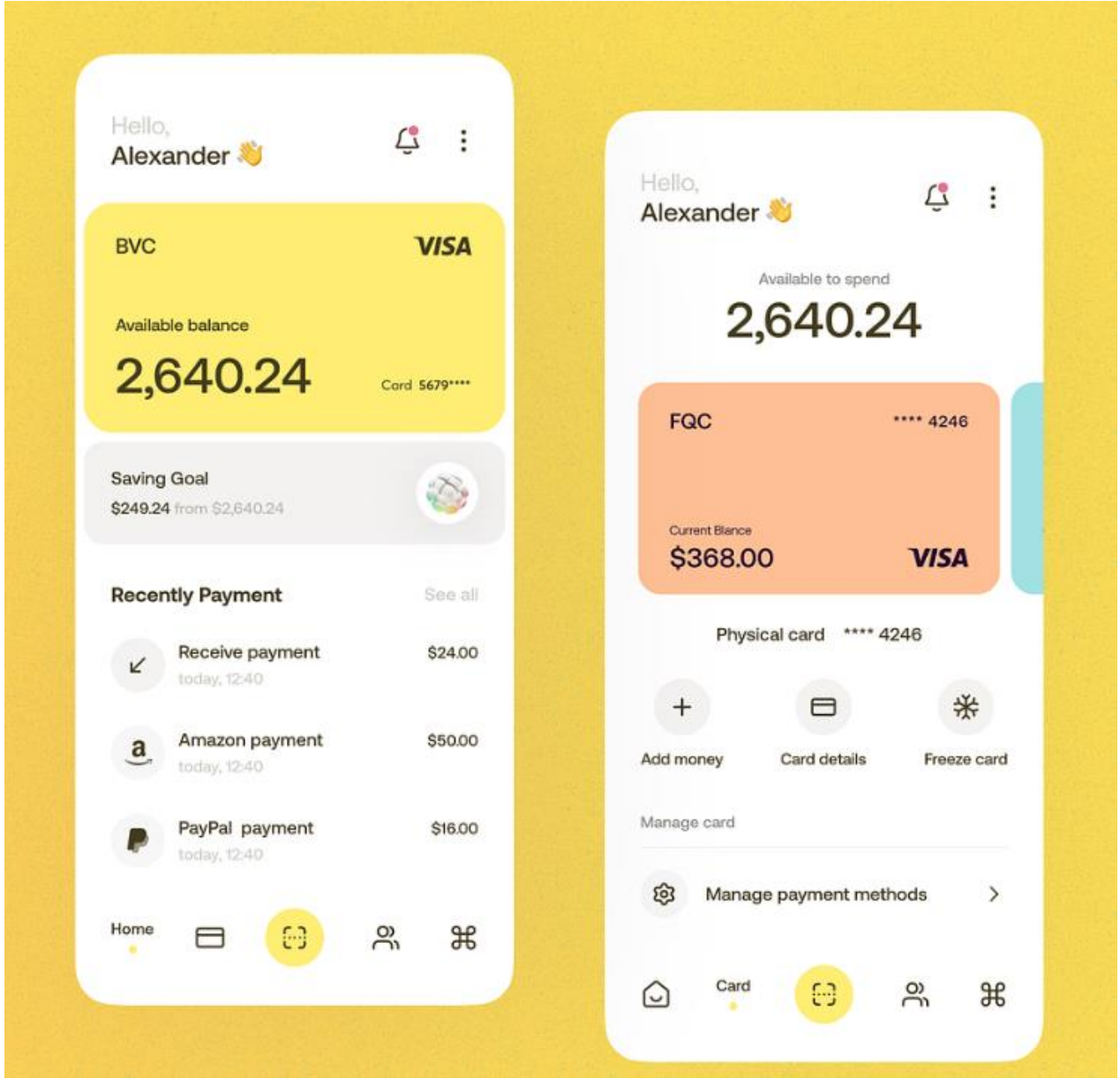
Example2: Mobile banking app

The UI design includes the

- layout of the login screen,
- the arrangement of buttons for different banking services (like checking balance, transferring funds),
- the color scheme used for different sections (green for successful transactions, red for errors), and
- the overall aesthetic appeal of the app.



Chapter 1

1. Ubiquitous Interaction
2. **Designing for a Quality User Experience in 3DApplications**
3. **Emerging Desire for Usability**
4. FROM USABILITY TO USER EXPERIENCE
5. **Enhancing the Visitor Experience through Web Design**
6. **Emotional Impact as Part of the User Experience**
7. **USER EXPERIENCE NEEDS A BUSINESS CASE**
8. **ROOTS OF USABILITY**

1.1 Ubiquitous Interaction

1. Desktops, Graphical User Interfaces, and the Web Are Still Here and Growing
2. The Changing Concept of Computing
3. The Changing Concept of Interaction

1.2 Designing for a Quality User Experience in 3D Applications

- **Motion controls** and **freehand gestures** are prevalent in modern interfaces.
- 3D interaction is gaining popularity across g***aming, home theaters, and mobile applications***.

Key Guidelines for Designing 3D User Interfaces

1. **Natural 3D Interactions**
   - Replicating real-world actions (walking, swinging golf club) / Easy to understand, high spatial awareness
2. **"Magic" 3D Interactions**
   - Enhance physical/perceptual/cognitive abilities
   - Allow superhuman capabilities in virtual world
   - More efficient than natural interactions
3. **Provide Helpful Constraints**
   - Guide users for easier, more precise interactions E.g. furniture only on floor, not free 3D space
4. **Design for User Comfort**
   - Avoid fatigue from extended 3D movements/ Allow arm/body support during manipulation
   - Minimize rapid motions causing dizziness / Proper viewing for stereoscopic displays
5. **Follow UX Principles**
   - Apply fundamental HCI and UX design principles / But utilize 3D-specific research & guidelines / Enable engaging, productive 3D experiences

1.3 Emerging Desire for Usability

- Earlier Computer usage was limited to technically oriented users. Increasing demand for better user usability and experiences as technology becomes mainstream
- Use cases that motivated the **usability improvement** research:
  - "**Dancing bear"** software.
  - UI for voting machines in spite of its failures
  - Airport Design for Prioritizing efficiency over aesthetics
  - San Jose Police Department's flawed emergency-response system

Technology users seek beauty, emotional satisfaction, and intellectual gratification.

Usability

- Usability is that aspect of HCI devoted to ensuring that human–computer interaction is, **effective, efficient, and satisfying** for the user.
- So usability includes characteristics such as
  - **ease of use,**
  - **productivity,**
  - **efficiency,**
  - **effectiveness,**
  - **learnability,**
  - **retainability, and**
  - **user satisfaction (ISO 9241-11, 1997).**

1.4 From Usability to User Experience

1. **The Traditional Concept of Usability** [ensure the interaction is effective, efficient, and satisfying for the user]
2. **Misconceptions about Usability** [is more than just usability testing - it involves the entire interaction design process.]
3. **The Expanding Concept of Quality in Design** [aspects like ambience, attention, aesthetics, social/cultural context etc.]
4. **Emotional Impact vs User Satisfaction** [in practice it focused more on intellectual responses than emotional impact]
5. **Functionality vs User Experience** [A better user experience can outsell products with more functionality (e.g. iPhone vs Blackberry).

1.4 From Usability to User Experience

6. **A Good User Experience is Not Necessarily High-Tech or "Cool" [**Cool technology alone does not inherently provide a quality user experience.]

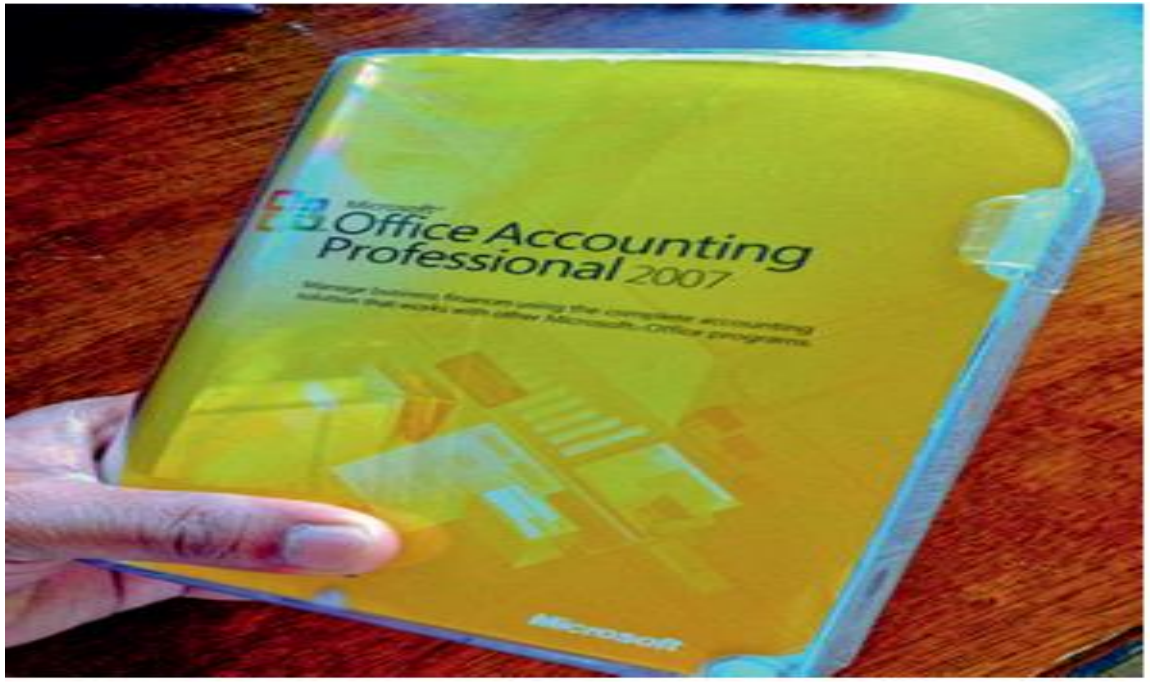


Figure 1-1
A new Microsoft software packaging design.

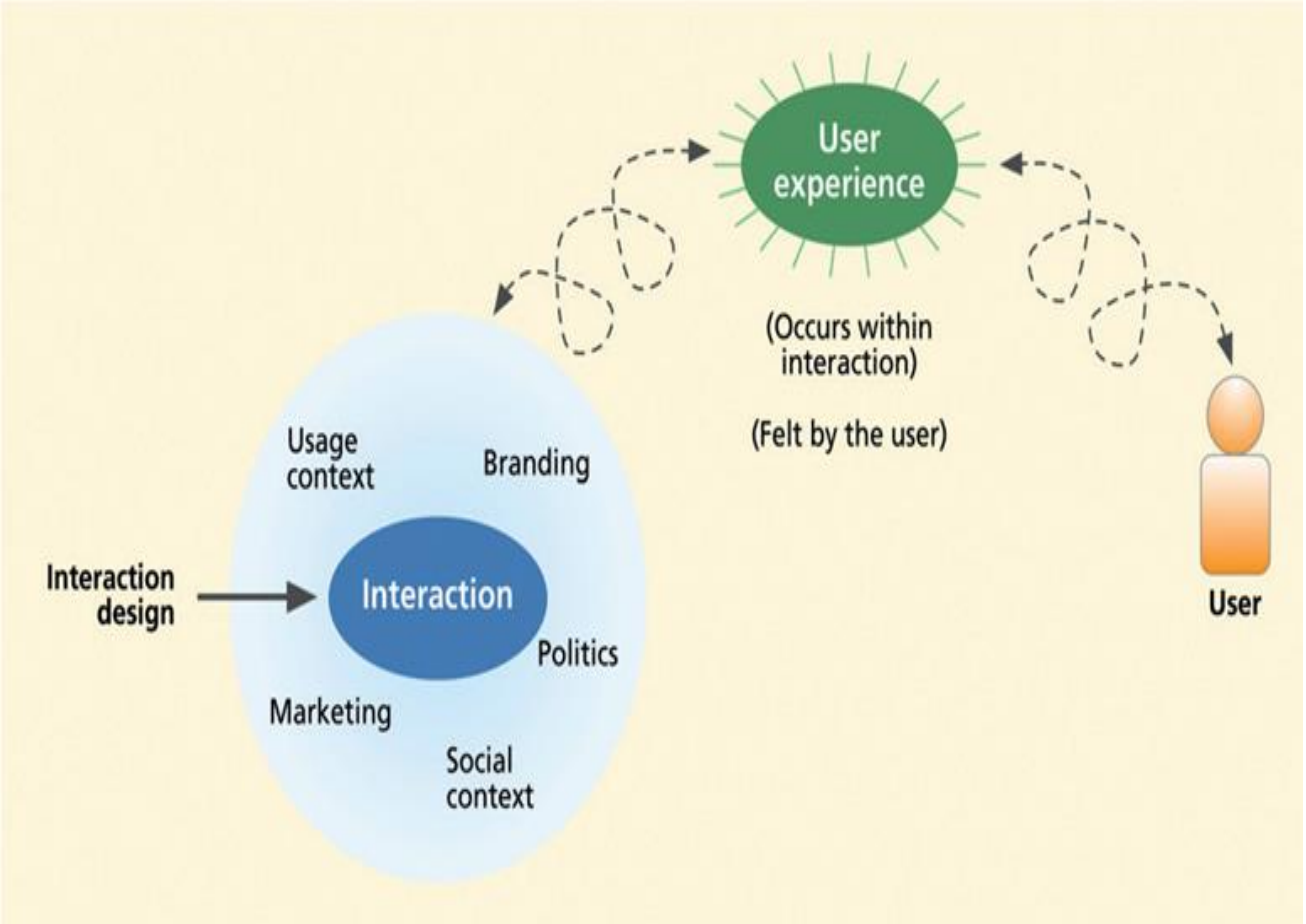
oclaims:

1.4 From Usability to User Experience

7. **Design Beyond Just Technology** [*software interfaces, ATMs, signage or other artifacts satisfying usage needs through a creator-user dialogue*.]
8. **Components of User Experience** [usability factors (ease of use, efficiency and effectiveness) and usefulness are components of user experience]
9. **User Experience is (Mostly) Felt Internally [**User experience is the totality of effects felt internally by the user from interacting with and using a system/product, including anticipation, actual usage, and memories afterwards.]

1.4 From Usability to User Experience

10. **User Experience Cannot Be Designed** [User experience cannot be directly designed or engineered - **only facilitated through good design.** It is revealed within a particular user's context and usage. **The same design may lead to different experiences for different users/contexts**.]



1.4 From Usability to User Experience

11. **Role of Branding, Marketing, and Corporate Culture** [The user experience can extend beyond just responses to usability, usefulness and joy of use. Social, cultural, marketing, political aspects, hardware choices etc. can also influence the experience. **Example** : BMW, Microsft, etc]
12. **Why Have Such a Broad Definition?** [The broad definition recognizes that user experience can begin before actual usage - *from initial product awareness to advertising to purchasing to unboxing*. It can persist after usage through memories and sharing with others.]

1.5 Enhancing the Visitor Experience through Web design

1. **Utility** [refers to the **usefulness, importance, or interest of a website's content** to its visitors. It is relative and varies among different visitors based on their needs and interests]
2. **Function Integrity** [measures the extent to which a website works as intended, free from issues like dead links, crashes, or browser incompatibility.]
3. **Usability** [Usability relates to how **easy it is for visitors to learn** and use a website efficiently, irrespective of its utility or functional integrity.]
4. **Persuasiveness** [focuses on how effectively a website encourages desired behaviors, like making a purchase or signing up for a newsletter]
5. **Graphic Design** [The graphic design of a website, including colors, images, and layout, can evoke emotional responses and influence the overall visitor experience.]

1.6 Emotional Impact as Part of the User Experience

1. **The Potential Breadth of Emotional Impact [**Emotional impact refers to the affective parts of interaction - pleasure, fun, aesthetics, novelty, sensations, and experiential features.]
2. **A Convincing Anecdote [**David Pogue uses the example of the iPad to illustrate the role of emotional allure. Critics initially dismissed it as superfluous since existing devices covered its functionality. Yet, it became wildly successful due to the finely crafted personal experience of using it, not rational utility. **]**
3. **Aesthetics and Affect [**experiential orientation focused on pleasure and beauty, same aesthetic design can evoke different emotions based on an individual's subjective experience **]**
4. **The Centrality of Context [**The same product is marketed differently (e.g. Garmin GPS) based on contrasting anticipated contexts and associated emotional resonance]
5. **What about Fun at Work? [**fun can enhance appeal and performance for repetitive tasks.]

1.7 USER EXPERIENCE NEEDS A BUSINESS CASE

Innovative Design with Seamless Connectivity: The Toshiba Satellite Receiver Box

1. **Is the Fuss over Usability or User Experience Real? [Poor user experience serves** as an uncontrolled source of overhead for companies using software, leading to lost productivity, error correction, data loss, learning and training costs, and expenses related to help desks and field support, "rethink current software design practice to incorporate user-centered design principles..]
2. **No One Is Complaining and It Is Selling Like Hotcakes [**It's easy to mistake positive signs, such as strong sales, as indicators that a product has no user experience problems. **]**
3. **A Business Strategy: Training as a Substitute for Usability in Design [**with training and practice, it will be a very intuitive design **]**

1.8 ROOTS OF USABILITY

1. **A Discipline Coming of Age [**Compared to established fields like architecture or civil engineering, computer science and human-computer interaction (HCI) are relatively young]
2. **Human Factors and Industrial and Systems Engineering**
3. **Psychology and Cognitive Science**
4. **Task Analysis**
5. **Theory**
6. **Formal Methods**
7. **Human Work Activity and Ethnography**
8. **Computer Science: Interactive Graphics, Devices, and Interaction Techniques**
9. **Software Engineering**

1.8 ROOTS OF USABILITY

1. **A Discipline Coming of Age [**Compared to established fields like architecture or civil engineering, computer science and human-computer interaction (HCI) are relatively young]
2. **Human Factors and Industrial and Systems Engineering [**efforts to improve industrial efficiency]
3. **Psychology and Cognitive Science [**Psychology played a significant role in shaping HCI, with cognitive psychology providing insights into human behavior and cognition.]
4. **Task Analysis [**a method to understand user tasks and interactions,]
5. **Theory [**HCI's foundation lies in psychological and cognitive theories, adapted to model user behavior and interaction with computers]

1.8 ROOTS OF USABILITY

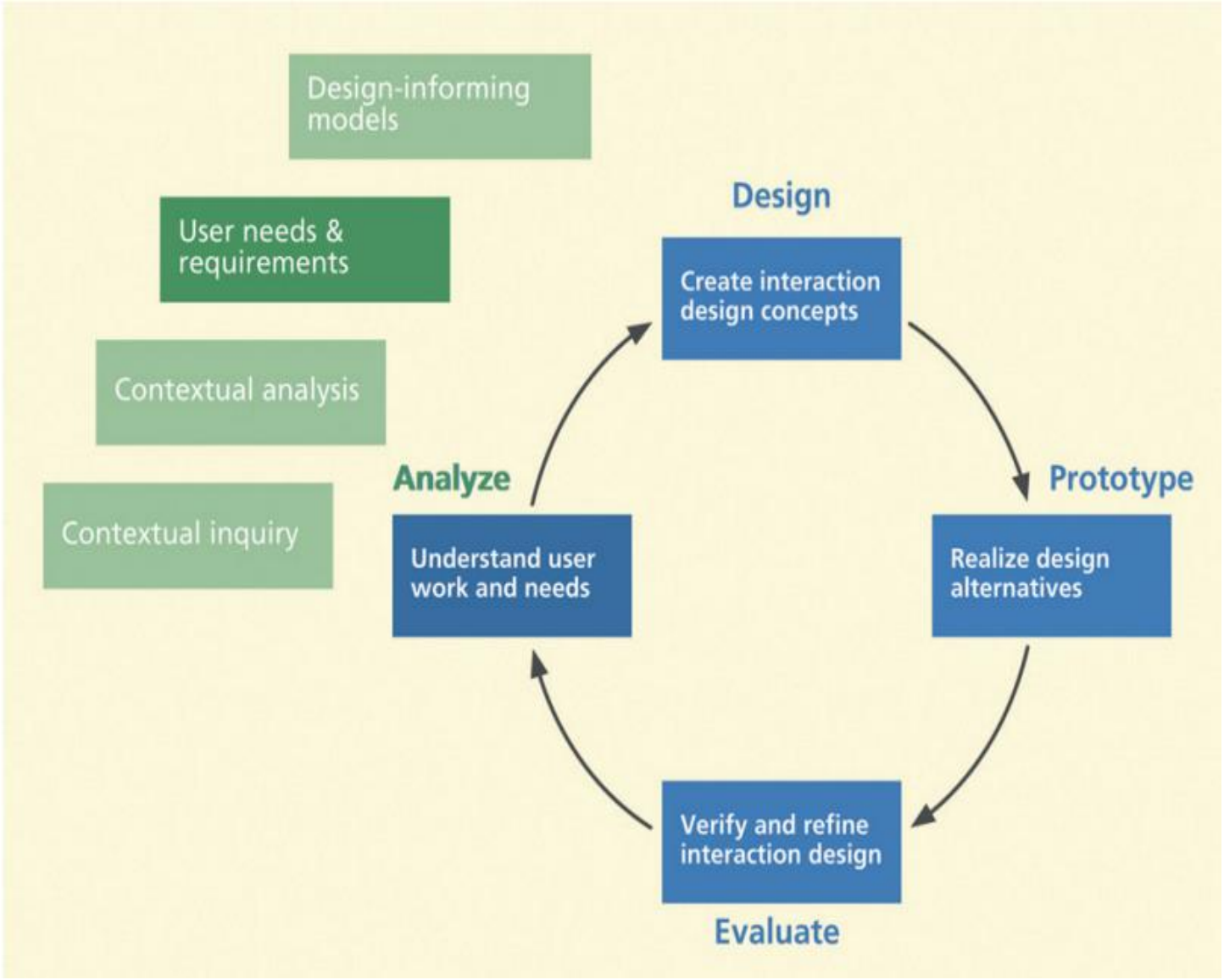
6. **Formal Methods**
7. **Human Work Activity and Ethnography[T**he scientific description of peoples and cultures with their customs, habits, and mutual differences / providing tools to study work practices and gather design requirements based on real-world contexts]
8. **Computer Science: Interactive Graphics, Devices, and Interaction Techniques**
9. **Software Engineering**

Extracting Interaction Design Requirements

1. Introduction : Contextual Analysis , Requirements and Gap between Analysis and Design
2. Needs and Requirements
3. Formal Requirements Extraction
4. Abridged Methods for Requirements

Introduction

- After doing **contextual analysis** user needs and requirements should be understood.
- The requirements gathering WAAD can be utilized. WAAD stands for "**Work Activity Affinity Diagram**".
- The WAAD provides an overview and understanding of the users' **current work practices, tasks, concerns, and usage contexts** within their work domain.

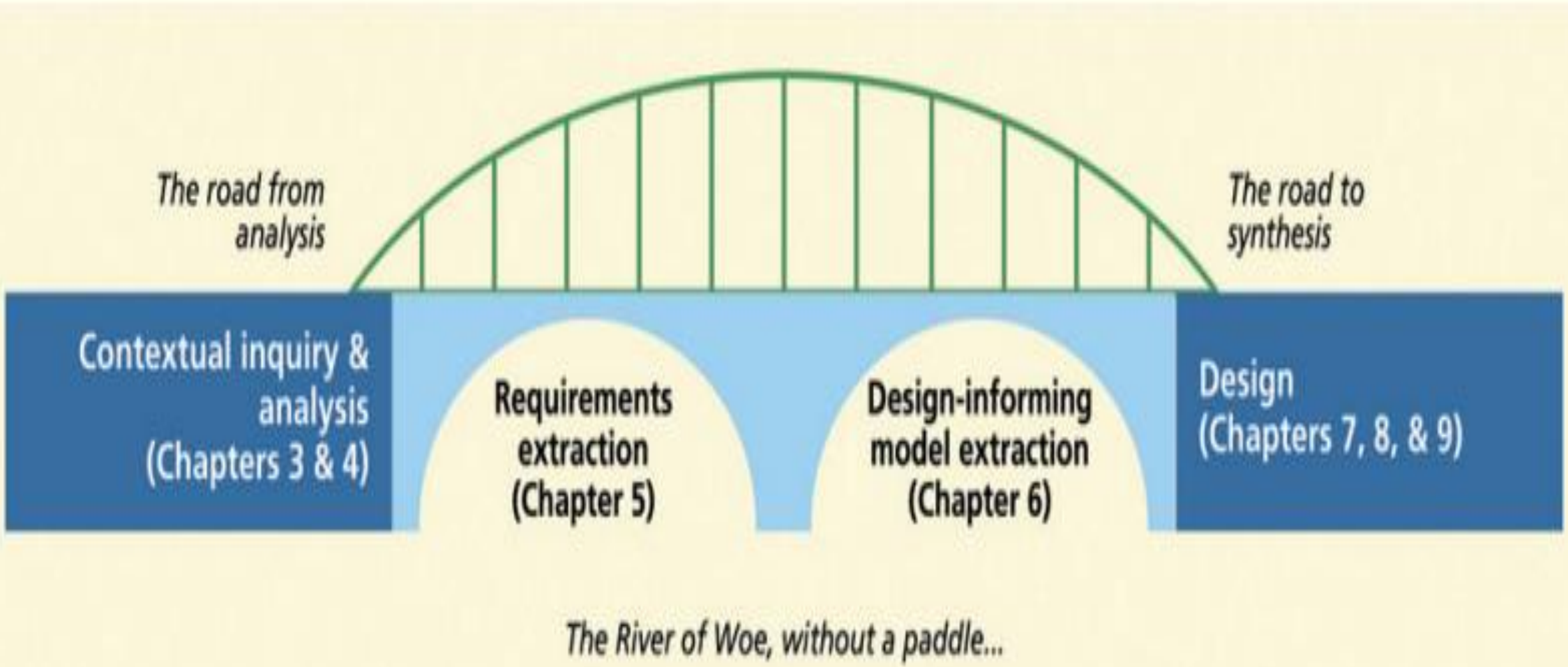


Gap between Analysis and Design

The key gaps between the analysis phase (contextual inquiry and understanding existing work practices) and the design phase (producing designs for a new system) are:

1. **Output mismatch**: The output of contextual inquiry and analysis describes the existing work domain, but does not directly provide the information needed as inputs for design.
2. **Cognitive shift**: There is a cognitive shift required in moving from analysis oriented thinking (focused on understanding current practices) to design oriented thinking (focused on envisioning new systems and work processes).
3. **Transition from old to new**: The gap represents the demarcation or separation between studying the old (existing work practices and systems) and envisioning the new (designing a new work space and system).
4. **Information needs differ**: The information gathered from contextual studies about the work domain does not inherently meet the specific information needs required for design activities.
5. **Translating insights**: There is a need to translate the insights and understanding gained from the analysis phase into actionable inputs and requirements that can inform the design of a new system.
6. **Bridging the gap**: Specific efforts and methods are required to bridge this gap between analysis and design, to ensure that the user research and contextual inquiry effectively inform the design process.

Overview of the bridge to design.



NEEDS AND REQUIREMENTS:

- "Requirements" in software development refer to statements outlining ***what is necessary to design a system that meets user and customer objectives***.
- In UX, interaction design requirements focus on supporting *user work activity needs and ensuring functional usefulness*.
- Additionally, requirements aim to address ***emotional impact and long-term user experience aspects***.

NEEDS AND REQUIREMENTS:

1. What are requirements?
2. Requirement Specifications : personas, tasks, user experience goals, or usage scenarios
3. Software and Functional Implications of Interaction Design Requirements

Formal Requirements Extraction

1. Walking the WAAD for Needs and Requirements
2. Switching from Inductive to Deductive Reasoning
3. Preparation
4. Svstematic Deduction of Needs as “Hinges” to Get at Requirements
5. Terminology Consistency
6. Requirement Statements
7. Requirement Statement Structure

Fig: Generic structure of a requirement statement

Name of major feature or category
Name of second-level feature or category
Requirement statement [WAAD source node ID]
Rationale (if useful): Rationale statement
Note (optional): Commentary about this requirement

Fig : Example requirement statement.

Security
Privacy of ticket–buyer transactions

Shall protect security and privacy of ticket-buyer transactions [C19]

Note: In design, consider timeout feature to clear screen between customers.

Formal Requirements Extraction

8. Requirements Document Structure
   - Example: Extracting a Requirement Statement for the Ticket Kiosk System

Figure : Sample requirement statement for the Ticket Kiosk System.

Transaction flow

..... *Recommendations for buying*

Ticket-buyer purchases shall be supported by recommendations for the purchase of related items. [DE2].

Implied system requirement: During a transaction session the Ticket Kiosk System shall keep track of the kinds of choices made by the ticket buyer along with the choices of other ticket buyers who bought this item. [DE2].

Note: Amazon.com is a model for this feature.

Figure : Example requirement statement for the Ticket Kiosk System

Finding events

Direct keyword search by event description

Ticket buyers shall be able to find (e.g., search) by content to identify relevant current and future events [CA9].

Browse events by parameters

Ticket buyers shall be able to browse by category, description, location, time, rating, and price.

Formal Requirements Extraction

9. **Continue the Process for the Whole WAAD**
10. **Keep an Eye out for Emotional Impact Requirements and Other Ways to Enhance the Overall User Experience**
11. **Extrapolation Requirements: Generalization of Contextual Data**
12. **Other Possible Outputs from the Requirements Extraction Process : Questions about missing data, System support needs, Marketing input [Example: Requirements Extraction for the Ticket Kiosk System]**
13. **Constraints as Requirements**
14. **Prioritizing Requirements**
15. **Taking Requirements Back to Customers and Users for Validation**
16. **Resolve Organizational, Sociological, and Personal Issues with the Customer**

ABRIDGED METHODS FOR REQUIREMENTS EXTRACTION

1. **Use the WAAD Directly as a Requirements Representation**
2. **Anticipating Needs and Requirements in Contextual Analysis**
3. **Use Work Activity Notes as Requirements (Eliminate the WAAD Completely)**

End of Module1