



## UID Module 1

Bachelor of Engineering (University of Mumbai)



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# 1

## Module - I

# Introduction to Interaction Design

### Syllabus

Good and Poor Design, What is Interaction Design, The User Experience, The Process Of Interaction Design, Interaction Design and the User Experience.

## 1.1 Good and Poor Design

### User Interface

The user interface, in the industrial design field of human-machine interaction, is the space where interactions between humans and machines occur.

#### Importance and benefits of good user interface design

- Firstly the more perceptible the UI the easier it is to use.
- The better the user interface the easier it is to guide people to use it and it also reduces the training costs.
- The better your user interface the less help people will require exploiting it.
- It will also reduce your sustain costs as well.

### 1.1.1 Importance of Good Design

#### 1. Good design makes a product useful

- A product is bought to be used.
- Good design emphasizes the usefulness of a product while disregarding anything that could possibly detract from its usefulness.

#### 2. Good Design is Innovative

- Innovation does not only imply something new, it also means product refinement.
- Good design usually comes from resourceful and creative people who take inventions and perfect them.





- In 1779, Samuel Crompton of Lancashire invented the spinning mule, which made possible the mechanization of cotton manufacture.
- Yet the innovation was continued by Henry Stones, of Horwich, who added metal rollers to the mule; and James Hargreaves, of Tottington, who figured out how to smooth the acceleration and deceleration of the spinning wheel; and William Kelly, of Glasgow, who worked out how to add water power to the draw stroke; and John Kennedy, of Manchester, who adapted the wheel to turn out fine counts; and, finally, Richard Roberts, also of Manchester, a master of precision machine tooling who created the "automatic" spinning mule : an exacting, high-speed, reliable rethinking of Crompton's original creation. Such men provided the micro inventions necessary to make macro inventions highly productive.

### **3. Good Design Makes a Product Understandable**

- Good design emphasizes simplicity and clarifies the product's structure and use.
- At best, it is self-explanatory and intuitive.
- No one likes things that are tricky to operate. Good design typically provides a high quality user manual, instructions, or user interface.

### **4. Good Design is Aesthetic**

- The aesthetic quality of a product is integral to its usefulness because products we use every day affect our well-being.
- Objects of beauty generate feelings of delight and pleasure, but only well-executed objects can be beautiful.

### **5. Good Design Makes Products Easy to Transport, Store, and Maintain**

- Good design reduces or eliminates tedious drudgery associated with the maintenance of a product (i.e., the cleaning of the object is designed to be quick and easy).
- Good design packages a product in a way that is small, stackable, standardized, easy to load on a truck or train and therefore easy to transport.

### **6. Good Design is Long-Lasting**

- Unlike fashionable design, products with good design are built to last many years.
- Planned obsolescence is when a product or part is made that is designed to fail, or become less desirable over time or after a certain amount of use.
- Our culture is trending toward a throwaway society based on over-consumption and excessive production of short-lived or disposable items.

- Non-durable goods (products used less than three years) make up 27% of all municipal solid waste, with durable goods making up 16%. Economic growth built on made-to-break products, planned obsolescence, and fashion is wasteful.

## 7. Good Design is Less Design

- Less is more.
- Good design is well-edited, concentrating only on the essentials.
- Truly great products are sleek, essential and easy to use.
- There's an honesty in good design : It does not try to make a product more innovative, powerful or valuable than it really is.
- It does not attempt to manipulate the consumer.

## 8. Good Design is Thorough, Down to the Last Detail

- Nothing is arbitrary.
- Care and accuracy in the design process shows respect towards the consumer.

### 1.1.2 Principles of Good Design

The general principles of the user interface can be given as follows :

#### 1. Aesthetically Pleasing

- A design is aesthetically pleasing if it is attractive to the eye. It draws attention subliminally, conveying a message clearly and quickly.
- Visual appeal is provided by following the presentation and graphic design principles which include meaningful contrast between screen elements, creating spatial groupings, aligning screen elements, providing three-dimensional representation, and using color and graphics effectively.

#### 2. Clarity

- User interface must be clear in visual appearance, concept and wording.
- Visual elements should be understandable and related to real world concepts and functions. Analogies should be simple.
- Interface words and text should be simple, unambiguous, and free of computer jargon.

#### 3. Compatibility

Compatibility needs to be provided as

- **User Compatibility** : "Know the user" is the fundamental principle in interface design as no users are alike and they think, feel and behave differently compared to the developer.



- **Task and job compatibility** : The structure and flow of functions should permit easy transition between tasks. The user must never be forced to navigate between applications or many screens to complete routine daily tasks.
- **Product compatibility** : Compatibility across products must always be considered in relation to improving interfaces. making new systems compatible with existing systems will take advantage of what users already know and reduce the necessity for new learning.

#### 4. Comprehensibility

- The steps to complete a task should be obvious. System should be understandable and flowing in meaningful order.
- A user should know what to look at, what to do, when to do it, where to do it, why to do it and how to do it.

#### 5. Configurability

- A default configuration as well as easy personalization and customization through configuration and reconfiguration should be provided.
- Customization enhances sense of control, encourages an active role in understanding and allows personal preferences and differences in experience levels leading to high user satisfaction.

#### 6. Consistency

- Consistency is important because it can reduce requirements for human learning by allowing skills learned in one situation to be transferred to another like it.
- Any new system must impose some learning requirements on its uses but avoid unnecessary activity.

#### 7. Control

- The user must control the interaction and never be interrupted for errors.
- Actions should result from explicit user requests and be performed quickly.

#### 8. Directness

- Tasks should be performed directly and alternatives should be visible reducing the user's mental workload.
- Tasks are performed by directly selecting an object then selecting an action performed and then seeing the action being performed.

## 9. Efficiency

- Transition between various systems controls should flow easily and freely.
- Navigation paths should be as short as possible.
- Eye movement through a screen should be obvious and sequential.

## 10. Responsiveness

- A user must be responded quickly.
- Substantial or more informative feedback is most important for the casual or new system user.
- All requests must be acknowledged in some way.

## 11. Simplicity

Simplicity can be achieved by progressive disclosure, provide defaults, minimize screen alignment points, make common actions points, make common actions simpler and provide uniformity and consistency.

## 12. Transparency

- Permit the user to focus on the task or job without concerning the mechanics of the interface.
- Working and reminders of workings inside the computer should be invisible to the user.

## 13. Trade-Offs

- Final design will be based on a series of trade-offs balancing often-conflicting design principles.
- People's requirements always take precedence over technical requirements.

## 1.2 Poor Design

### 1.2.1 What Is Poor Design?

- If a user cannot physically connect with a product in a satisfying manner, that product is a poor design. Or bad design is called as.
- Example of poor design is ATM's that spit out your card after the cash : ATM users are waiting for one thing : cash. So when the cash dispenses their immediate reaction is to leave that's why it's imperative that the cash comes out last : people are far less likely to forget their card if it comes out before the cash.
- Poor design user interface common mistake to need



1. **Design Lacks of contrast** : The poor contrast makes the text become blurry to the eye. Actually, it's not hard to improve the readability, just make use of everything - the color, space, and size to make them have high contrast. Besides, the small font size makes the readability of the text extremely poor.
2. **Not-responsive design** : It's pretty popular to use responsive design, because we find there's no reason for us to make a website which cannot adapt to the given resolution and device size. It's a must especially for shopping cart websites/Apps whose target audiences are coming from mobile.
3. **No user feedback with plagiarism data** : Unintentional plagiarism is not giving proper credit for someone else's ideas, research, or words, even if it was not intentional to present them as your own. Even if it was not intentional, it is still plagiarism and not acceptable. Accidentally failing to cite your sources correctly.
4. **Poor IA (Information Architect)** : Information architecture (IA) focuses on organizing, structuring, and labeling content in an effective and sustainable way. The goal is to help users find information and complete tasks.
5. **Inconsistent style** : UI design should be consistent on the style in order to make users clearly understand and respond to the given content. This will also do good to improve the work efficiency.

## 1.2.2 Comparison between Good Design and Poor Design

Good Design	Poor Design
Good design emphasises the usefulness of a product whilst disregarding anything that could possibly detract from it.	If a user cannot physically connect with a product in a satisfying manner, that product is a poor design.
The design is unforgettable. It always remember	The Design is forgettable.
The Good design interfaces are almost invisible to the user.	Poor Design is Sluggish and unresponsive interaction will be slow and clunky.
Good design avoid unnecessary elements and are clear in the language they use on labels and in messaging.	<b>Complicated</b> : The site will be hard for people to understand
Create consistency and use common UI (user interface) elements.	<b>Confusing</b> : It will be unclear about where the visitor should go next

Good Design	Poor Design
By using common elements in your UI, users feel more comfortable and are able to get things done more quickly.	<b>Inconsistent design</b> : pages will look different, throwing users off.
Example of good design : Rocking Wheel Chair the design is neat and clean or understanding.	Example of poor design is ATM's that spit out your card after the cash : ATM users are waiting for one thing: cash. So when the cash dispenses their immediate reaction is to leave. that's why it's imperative that the cash comes out last : People are far less likely to forget their card if it comes out before the cash

## 1.3 What is Interaction Design ?

### 1.3.1 Interaction Design

- Interaction design focuses on creating engaging interfaces with well thought out behaviours. Understanding how users and technology communicate with each other is fundamental to this field.
- With this understanding, you can anticipate how someone might interact with the system, fix problems early, as well as invent new ways of doing things.
- Technically, an interaction designer and a user experience designer could work on the same areas of a design.
- However, if the two roles exist together in a company, an interaction designer would be more focused on how the system and user interact with each other. Let's dig a little deeper to better understand the difference.
- Illustrated Fig. 1.3.1 : Interaction-design

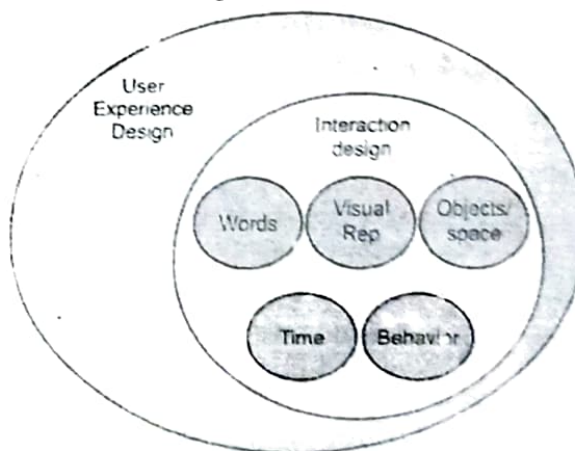


Fig. 1.3.1 : Interaction Design

- An interaction designer (IxD) defines the structure and behavior of interactive systems to create meaningful relationships between people and the products they use.
- A user experience designer (UXD) focuses on the entire experience between a user and the product, not just the interactions. A UX designer is also striving to create meaningful experiences with people and the products they use.

### 1.3.2 Dimension of Interaction Design

The dimensions represent the aspects an interaction designer considers when designing interactions.

- Words (1D) encompass text, such as button labels, which help give users the right amount of information.
- Visual representations (2D) are graphical elements such as images, typography and icons that aid in user interaction.
- Physical objects/space (3D) refers to the medium through which users interact with the product or service - for instance, a laptop via a mouse, or a mobile phone via fingers.
- Time (4D) relates to media that changes with time, such as animations, videos and sounds.
- Behavior (5D) is concerned with how the previous four dimensions define the interactions a product affords - for instance, how users can perform actions on a website, or how users can operate a car. Behavior also refers to how the product reacts to the users' inputs and provides feedback.
- Interaction designers utilize all five dimensions to consider the interactions between a user and a product or service.

## 1.4 Interface Design Process

Interaction design is specifically a discipline which examines the interaction (via an interface) between a system and its user. It may also incorporate design focused on how information should be presented within such a system to enable the user to best understand that information though this is often considered to be the separate discipline of "information design" too.

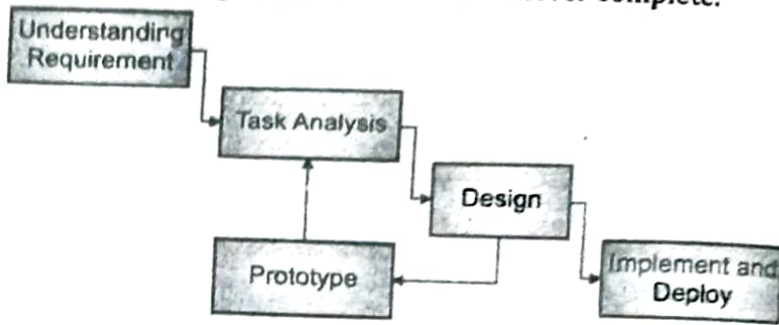
Interaction design is about creating interventions in often complex situations using technology of many kinds including PC software, the web and physical devices.

### Design Involves

- Achieving goals within constraints and trade-off between these.
- Understanding the raw materials : Human and computer.
- Accepting limitations of humans and of design.



Design process has several stages and is iterative and never complete.



**Fig. 1.4.1 : Interaction Design Process**

The Fig. 1.4.1 shows simplified interaction design process with four main phases and one iteration loop.

### **Stage 1 : Understanding Requirement**

- This stage is establishing what exactly needed.
- As a precursor to this it is usually necessary to find out what is currently happening.
- For example, what personal devices people are using?
- There are number of techniques used in this in HCI.
  - Interviewing people
  - Videotaping
  - Looking at document and objects that they work with
  - Observing them directly
- Ethnography, a form of observing from anthropology, has become very influential in this stage.

### **Stage 2 : Task Analysis**

- Task analysis is the study of the way people perform tasks with existing systems.
- The results of observation and interview need to be ordered in some way to bring out key issues and communicate with later stages of design.

There are several task models which are a means to capture how people carry out various tasks that are part of their work and life.

Techniques for task analysis :

- Decomposition of tasks into subtasks
- Classification of task knowledge
- Entity relationship based approach

1. **Decomposition of tasks** : As the name suggest it decomposes tasks into subtasks.  
These subtasks can be recorded either in a textual outline format or in a tree diagram
2. **Classification of task knowledge** : It builds taxonomies of the objects used during a task and the action performed upon them.  
Cutting the taxonomy at some level gives us a set of generic objects and action.
3. **Entity relationship based approach** : It is an analysis technique usually associated with database design and more recently object-oriented programming

### Stage 3 : Design

- It is stage where we move from what you want from how to do it.
- There are numerous rules, guidelines and design principles that can be used to help with this.
- Main goal of this stage is designing for maximum usability.
- Design patterns provide a potentially generative approach to capturing and reusing design knowledge.
- We need to record our design choices in some way and there are various notations and methods to do this, including those used to record the existing situations.
- It is at this stage also where input from theoretical work is most helpful, including cognitive models, organizational issues and understanding communication.
- There are various visual tools that could help us to ensure that the physical structure of our screen emphasized the logical structure of the user interaction.
- These tools included physical grouping, ordering of items, decoration such as fonts, lines and color, alignment and use of white space.
- These are important both for appropriate display of information and to layout controls and data entry fields for ease of use.
- Aesthetics are also important, but may conflict with utility.
- Depending on the context you may need to make different trade-offs between these.

### Stage 4 : Iteration and Prototyping

- Humans are complex and we cannot expect to get design right first time.
- We therefore need to evaluate a design to see how well it is working and where there can be improvement.
- Iteration and prototyping are universally accepted "best practice" approach for interactive design.
- However there are some major pitfalls of prototyping like local maxima.

- Evaluation is integral part of design process and should take place through-out the design life cycle.
- Its aim is to test the functionality and usability of the design and to identify and rectify any problem.
- It can also try to determine the user's attitude and response to the system.
- Evaluation may take place :
  - In laboratory
  - In the field
- Some approaches are based on expert evaluation :
  - Analytic methods
  - Review methods
  - Model-based methods
- Some approaches involve users :
  - Experimental methods
  - Observational methods
  - Query methods
- The choice of evaluation method is largely dependent on what is required of the evaluation.
- Some form of evaluation can be done using design on paper, but it is hard to get real feedback without trying it out.
- Therefore most interaction designs involves some type of prototyping, producing early versions of systems try out with real users.
- There are two things you need in order for prototyping methods to work :
  1. To understand what is wrong and how to improve.
  2. A good start point.

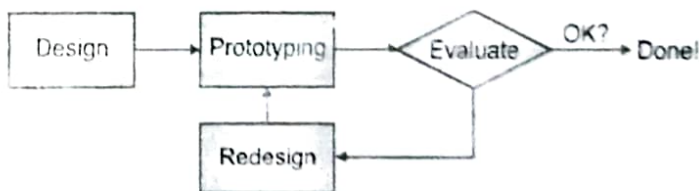


Fig. 1.4.2 : Role of Prototyping

### Stage 5 : Implementation and deployment

Finally when we are happy with our design, we need to create it and deploy it.

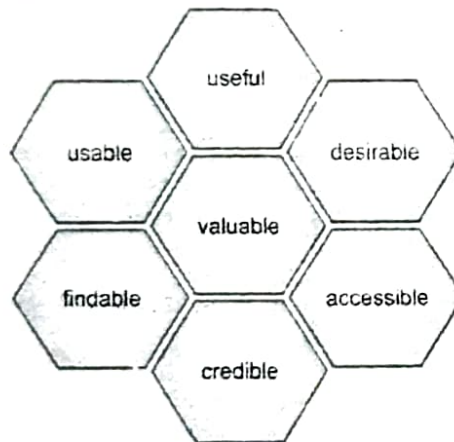


### 1.4.1 Interface Design Goals

- Reduce visual work
- Reduce intellectual work
- Reduce memory work
- Reduce motor work
- Minimize or eliminate any burdens or obstructions imposed by technology

## 1.5 User Experience

- User experience design focuses on the overall experience between a user and a product.
- It is not just concerned with the interactive elements but also the way that certain elements look, feel or contrive to deliver certain outputs.
- It also takes into account the business goals and objectives of the group managing the project.
- UX best practices promote improving the quality of the user's interaction with and perceptions of your product and any related services.
- UX is important because it tries to fulfill the user's needs. It aims to provide positive experiences that keep users loyal to the product or brand. Additionally, a meaningful user experience allows you to define customer journeys on your website that are most conducive to business success.
- Factors of user interface that in order for there to be a meaningful and valuable user experience, information must be :



**Fig. 1.5.1 : User experience factors**

1. **Useful** : Your content should be original and fulfill a need
2. **Usable** : Site must be easy to use

3. **Desirable** : Image, identity, brand, and other design elements are used to evoke emotion and appreciation
4. **Findable** : Content needs to be navigable and locatable onsite and offsite
5. **Accessible** : Content needs to be accessible to people with disabilities
6. **Credible** : Users must trust and believe what you tell them

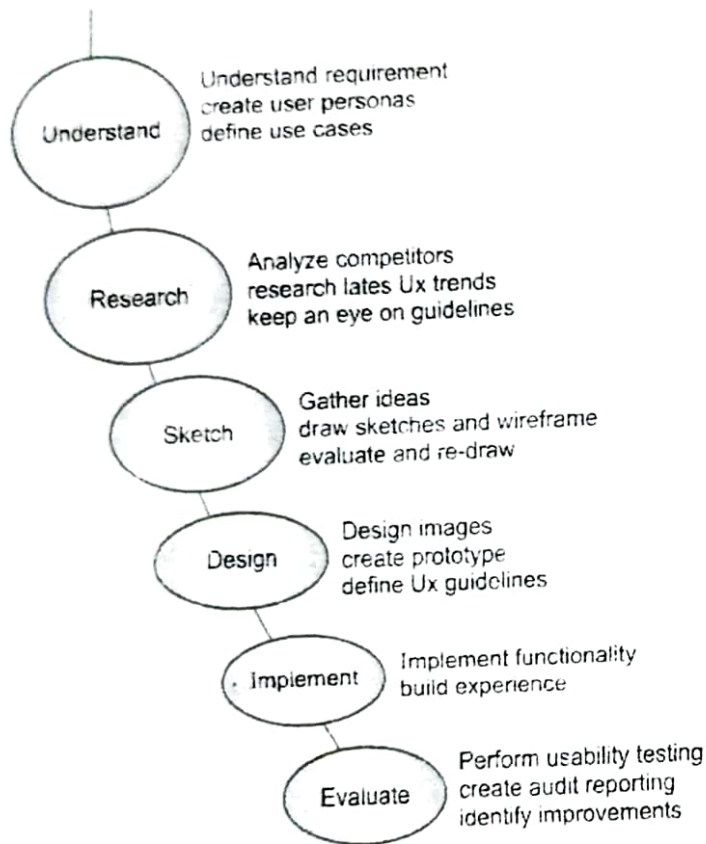
### 1.5.1 Building the User Experience

UX is a growing field that is very much still being defined. Creating a successful user-centered design encompasses the principles of human-computer interaction (HCI) and goes further to include the following disciplines :

- **Project Management** focuses on planning and organizing a project and its resources. This includes identifying and managing the lifecycle to be used, applying it to the user-centered design process, formulating the project team, and efficiently guiding the team through all phases until project completion.
- **User Research** focuses on understanding user behaviors, needs, and motivations through observation techniques, task analysis, and other feedback methodologies.
- **Usability** evaluation focuses on how well users can learn and use a product to achieve their goals. It also refers to how satisfied users are with that process.
- **Information Architecture (IA)** focuses on how information is organized, structured, and presented to users.
- **User Interface Design** focuses on anticipating what users might need to do and ensuring that the interface has elements that are easy to access, understand, and use to facilitate those actions.
- **Interaction Design (IxD)** focuses on creating engaging interactive systems with well thought out behaviors.
- **Visual Design** focuses on ensuring an aesthetically pleasing interface that is in line with brand goals.
- **Content Strategy** focuses on writing and curating useful content by planning the creation, delivery and governance behind it.
- **Accessibility** focuses on how a disabled individual accesses or benefits from a site, system or application. Section 508 is the governing principal for accessibility.
- **Web Analytics** focuses on the collection, reporting, and analysis of website data.

### 1.5.2 User Experience Process

- User experience design process is an iterative method that helps you continuously improve and polish your designs.
- In the process, you go through different stages repeatedly while evaluating your designs on each stage.
- Each stage involves relevant stakeholders in your organization that take part in the process to make your products highly efficient and usable.
- The design process involves six stages which are shown in Fig. 1.5.2.



**Fig. 1.5.2 : Stages of UX Design Process**

- Below is the detail that highlights stakeholders involved, activities being done and outcome produced during each stage of the process.

#### 1. Understand

- Design solves a problem. In order to provide a solution, you first need to understand the problem. "Before beginning the design work, let your Design team understand the requirement clearly."



- To analyze requirements, follow industry standard user research methods including contextual and individual interviews, while observing the users in real environment.
- Conduct brainstorming sessions with clients and show them your existing products (if any) to get their feedback.
- Business Manager is the role in an organization that works directly with clients and gets requirements from them. Design team can work closely with Business Manager to understand users and their needs.

#### **Stakeholders**

- Design Team
- Business Manager
- Product Manager

#### **Activities**

- Meet, talk, observe and understand users in their environment
- Analyze requirements to understand and clarify them
- Define user personas and use-cases

#### **Outcomes**

- User Personas
- User Stories
- Use Cases, User Flows

## **2. Research**

- Research is the basic key step to design user experience.
- Design team does their research work to explore how the outer world is working on such features.
- Listed three purposes of this analysis :
  - a) Understand market competition
  - b) Learn about your domain
  - c) Get inspirations and ideas from your competitors
- Keep an eye on the latest UI trends, design principles and your existing user experience guidelines. While doing research, start thinking about possible layouts and options to provide the desired experience.

#### **Stakeholders**

- Design Team

**Activities**

- Study of competitors' approaches
- Research on similar features in the world
- Analysis of latest UI/UX trends, design principles and rules
- Keep an eye on your own UX guidelines

**Outcomes**

- A bunch of ideas and material on which you can build your actual design work

**3. Sketch**

- This stage involves UI definition of required feature. Design team drives this activity, which is based on the last two stages of the process.
- Draw paper sketches, white board flows and wireframes to share your ideas with stakeholders.
- This stage itself is an iterative process.
- "Designing is not something that you just create and start using it. Draw and draft and redraw and redraft, thus creating an unmatched experience."
- Testing and evaluation of wireframes is part of this stage. Design team builds initial mock-ups and share with stakeholders to get their input.
- Throughout the process, it is important to keep your goal in mind : **make a usable design to achieve end user satisfaction.**

**Stakeholders**

- Design Team
- Product Managers
- Technical Experts

**Activities**

- Generate ideas and work on basic sketches
- Brainstorming sessions with stakeholders to get their feedback from technical perspective
- Re-draw sketches and re-test them with stakeholders

**Outcomes**

- Sketches
- Wireframes, Mockups
- User flows

#### 4. Design

- We finalized layout and flow of the required interface with you, the next step is to work on final graphics.
- Turn the initial mock-ups' and wireframes to great-looking images with theme and styles applied to them.
- Preparing and sharing of design specifications (principles, guidelines, colors, typography, and iconography) to Development team is also part of this stage.

##### Stakeholders

- Design Team
- Product Managers
- Business Manager
- Technical Experts

##### Activities

- Design UI images
- Define final theme, specs, and guidelines required for implementation
- Design icons to display on screens
- Sessions with stakeholders to get their feedback from business and technical perspective

##### Outcomes

- Design images
- Detailed design specs like colors, theme, styles, guidelines
- Icons

#### 5. Implement

- Development team builds back end functionality first and connects it with UI when they get design artifacts.
- It is better that Design team involves in this step to help development phase. While implementing, it is possible to raise the need of minor changes in design.

##### Stakeholders

- Development team
- Design Team



#### Activities

- Implement back-end functionality and front interface

#### Outcomes

- Developed UI with complete functionality and experience following the designed theme and style

### 6. Evaluate

When product features are implemented, the end product is evaluated based on few factors :

- Whether the system is usable ?
- Is it easy to use for end user ?
- Is it flexible and easy to change ?
- Does it provide the desired solution to user's problems ?
- Does the product have the credibility that makes someone want to use it because of the experience it provides ?

#### Stakeholders

- Design Team
- Product Manager

#### Activities

- Go through the flow and feel the experience
- Perform a comparison of implementation and defined interface

#### Outcomes

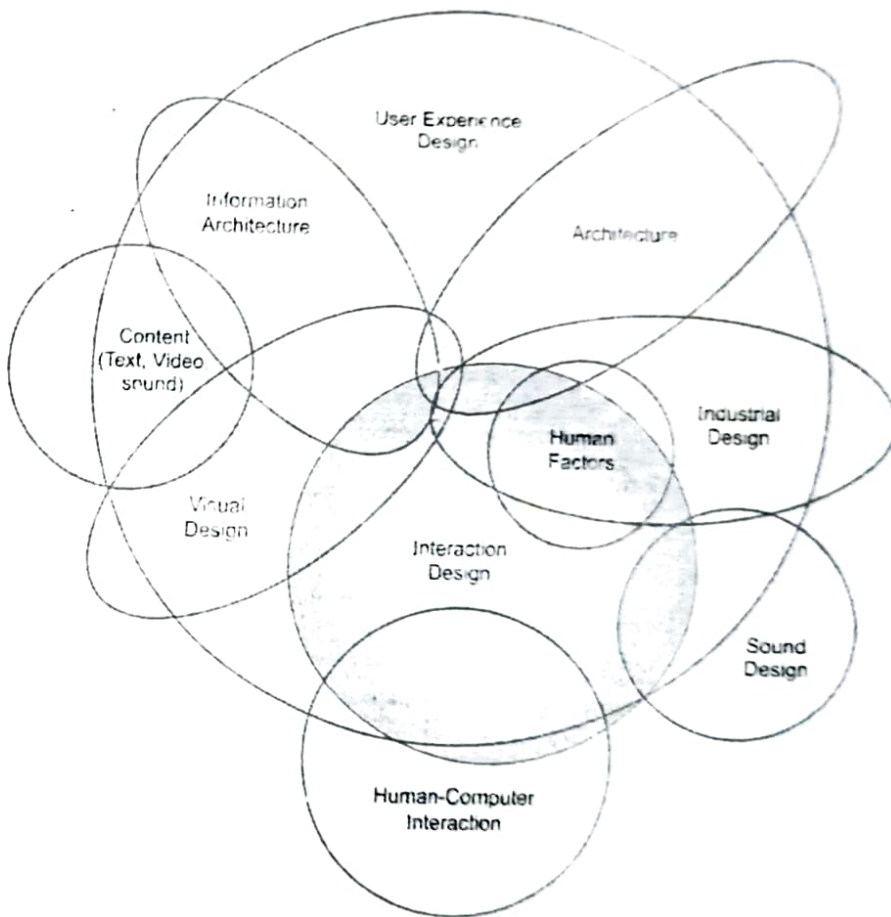
- User feedback
- UI audit reports
- Areas marked where improvement is required

## 1.6 Interaction Design and the User Experience

- The term "interaction design" is sometimes used interchangeably with "user experience design."
- That's understandable because there's a huge overlap between interaction design and UX design. After all, UX design is about shaping the experience of using a product, and a major part of that experience involves interaction between the user and the product. But interaction design and user experience aren't synonymous.



- The key difference between UX and interaction design is in the way we think about user interactions.
- Interaction designers are focused on the moment when a user interacts with a product and their goal is to improve the interactive experience.
- For UX designers, the moment of interaction is just a part of the journey that a user goes through when they interact with a product.
- User experience design accounts for all user-facing aspects of a product or system.



**Fig. 1.6.1 : Interaction design is a part of UX design**

UX design and interaction design are connected but it's nearly impossible to create good interaction design in isolation of UX. Interaction design is a spoke in the umbrella of user experience (UX design).

### 1.6.1 Comparison between User Interface(UI) and User Experience(UX)

User interface (UI)	User experience (UX)
Interaction design is specifically a discipline which examines the interaction (via an interface) between a system and its user	User experience design focuses on the overall experience between a user and a product.
Interaction designers are focused on the moment when a user interacts with a product and their goal is to improve the interactive experience.	UX designers, the moment of interaction is just a part of the journey that a user goes through when they interact with a product
Interaction design, information architecture, visual design, usability, and human-computer interaction	User experience design is a concept that has many dimensions, and it includes a bunch of different disciplines
UI design, user experience design focuses on creating interactions designed to meet or assist a user's goals and needs.	The goal of UX design is to create a seamless, simple, and useful interaction between a user and a product, whether it be hardware or software.
It may also incorporate design focused on how information should be presented within such a system to enable the user to best understand that information though this is often considered to be the separate discipline of "information design" too.	It is not just concerned with the interactive elements but also the way that certain elements look, feel or contrive to deliver certain outputs.
This field focuses specifically on the visual side of the software	Interaction design focuses on how a user interacts with specific elements of the software.
Refer Fig. 1.3.1 : User Interaction	Refer Fig. 1.5.1 : User Experience

#### Review Questions

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|------|---|------------|
| Q. 1 | Compare Good Design and Poor Design                             | (5 Marks)  |
| Q. 2 | Explain User interface Design Process in details                | (10 Marks) |
| Q. 3 | Write a short note on: Importance of user experience            | (10 Marks) |
| Q. 4 | Explain User Experience Design Process in details               | (10 Marks) |
| Q. 5 | Difference between User interface (UI) and User experience (UX) | (10 Marks) |