UNIT 4

The UX Design Process

Information, Architecture and Interaction Design and Prototyping Introduction, Design paradigms, Design thinking, Design perspectives, User personas, Ideation, Sketching, More about phenomenology, Mental Models and Conceptual Design, Wireframe, Prototyping

DESIGN PARADIGMS

The history of the focus of design in human computer interaction (HCI) as a series of paradigms: engineering, human information processing (HIP), and phenomenological.

- Engineering and human factors: deconstruct work with the objective of designing the machine for optimum human performance.
- Cognitive science: the theory of what is happening in the human mind during and with respect to interaction by treating human minds as information processors.
- The phenomenological paradigm (they call it the phenomenological matrix): emphasis in interaction is about making meaning (more on this later).
- **Engineering Paradigm**
- With recognition that user interaction deserved attention on its own, usability engineering emerged as a practical approach to usability with a focus on improving user performance, mainly through evaluation and iteration.
- The engineering approach casts design as just another lifecycle phase, a systematic approach that often works well for building systems with complex work domains.
- The engineering paradigm also had strong roots in human factors, where work was studied, deconstructed, and modeled. Here, the goal was user productivity and eliminating user errors.
- An example is the study of an assembly line where each action required to do work efficiently was described carefully. These descriptions were then more or less translated into requirements.
- **Human Information Processing (HIP) Paradigm**
- The HIP paradigm has its roots in psychology and human factors, from which it gets an element of cognitive theory. Especially as

psychology is used in the discipline of human factors, it is about human mental states and processes; it is about modeling human sensing, cognition, memory, information understanding, decision making, and physical performance in task execution.

- The idea was that once these human parameters were codified, it is possible to design a product that "matches" them. Guidelines, such as not having more than seven plus or minus two items on transient lists on a user interface because of limits on human short-term memory, were a result of this type of thinking.

- **Design-Thinking Paradigm**

- This third design paradigm brings a vision of the desired user experience and product appeal and how the design of a product can induce that experience and appeal.

- As a contrast to the other two paradigms, the third one is not about the utilitarian aspects but more about the emotional and phenomenological ones.

- The design-thinking paradigm is about social and cultural aspects of interaction and the design of "embodied interaction" because it is about interaction involving our whole bodies and spirit, not just our fingertips on a keyboard.

- It is also about "situated" design because it is about the notion of "place" with respect to our interaction with technology.

- These paradigms are just frameworks within which to think about design. The paradigms are not necessarily mutually exclusive; they do overlap and can be complementary. In most real system or product development, there is room for more than one approach.

- Even the most innovative design thinking can benefit from being grounded in a real understanding of user work practice and user needs that comes from contextual inquiry and analysis.

- And even creative design thinking must still be directed and informed, and informing design can mean doing contextual inquiry and analysis, modeling, requirements extraction, prototyping, and so on.

- Similarly, there is need for creativity and innovation in all three paradigms.

Design thinking

- The design-thinking paradigm is an approach to creating an experience that includes emotional impact, aesthetics, and social- and value-oriented interaction.
- The design of the product concept and design for emotional impact and the user experience comes first; it is a design-driven process.
- Designers are called upon to create a new vision, taking customers and users to a profound and satisfying user experience. After the design concept emerges, then engineers can follow up by providing the functionality and interaction design to make the vision a reality.
- Design thinking is market oriented, requiring a thorough understanding of the market, trends in usage and technology, and the competition.
- As such, design thinking is not just the world of dreamers and geeks; it has become an essential business tool for decision making and marketing.
- Design thinking is broadly attentive to the product, packaging, presentation, and customer support. Design thinking is an eclectic blend of art, craft, science, and invention.

Design perspectives

We describe three design perspectives as filters through which we view design and design representations to guide thinking, scoping, discussing, and doing design.

Ecological Perspective

- The ecological design perspective is about how the system or product works within its external environment. It is about how the system or product is used in its context and how the system or product interacts or communicates with its environment in the process.
- This is a work role and workflow view, which includes social interaction and long-term phenomenological aspects of usage as part of one's lifestyle.
- System infrastructure plays an important role in the ecological perspective because the infrastructure of a system, the other systems and devices with which it interacts in the world, is a major part of its

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ecology. Infrastructure leads you to think of user activities, not just isolated usage.

Interaction Perspective

- The interaction design perspective is about how users operate the system or product.
- It is a task and intention view, where user and system come together.
- It is where users look at displays and manipulate controls, doing sensory, cognitive, and physical actions.

Emotional Perspective

- The emotional design perspective is about emotional impact and value sensitive aspects of design. It is about social and cultural implications, as well as the aesthetics and joy of use.

USER PERSONAS

A persona represents a specific person in a specific work role and sub-role, with specific user class characteristics. Built up from contextual data, a persona is a story and description of a specific individual who has a name, a life, and a personality.

Why Do We Need Them?

- Common sense might dictate that a design for a broad user population should have the broadest possible range of functionality, with maximum flexibility in how users can pick the parts they like the most.
- We cannot make a single design the best for everyone, it is better to have a small percentage of the user population completely satisfied than the whole population half-satisfied.
- *Edge cases and breadth:* Personas are essential to help overcome the struggle to design for the conflicting needs and goals of too many different user classes or for user classes that are too broad or too vaguely defined.
- In situations where users for one work role come from different user classes, but all have to take on the same work role, a persona lets us focus on designing literally for a single person and liberates them from having to sort through all the conflicting details of multiple user classes.

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- Designers designing for themselves: One common way designers do stray from thinking about the user is when they design for themselves. In most project environments, it is almost impossible for designers to not think of the design in terms of how they would use it or react to it.

How Do We Make Them?
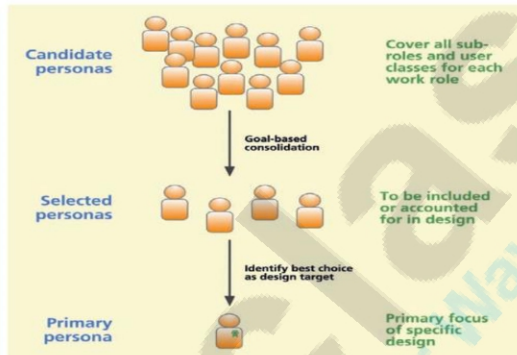
- **Identifying candidate personas** Although personas are hypothetical, they are built from contextual data about real users. In fact, candidate personas are identified on the fly as you interview potential users.
- **Goal-based consolidation** The next step is to merge personas that have similar goals. For example, in the Ticket Kiosk System we have a persona of an undergraduate student ticket buyer sub-role who lives on campus and is interested in MU soccer tickets. Another persona in the same work role, this time a graduate student who lives off campus, is interested in MU tennis tickets.

Characteristics of Effective Personas

- **Make your personas rich, relevant, believable, specific, and precise:** The detail of a persona has to be a rich part of a life story. It has to be specific and precise; this means lots of details that all fit together. Give your persona a personality and a life surrounded with detailed artifacts.
- **Make your personas "sticky":** Personas need to get lots of visibility, and their personalities need to be memorable or "sticky" in the minds of those who encounter them.

- **Where personas work best:** When personas are used in designing commercial products or systems with relatively simple work domains, they help account for the nuances and the activities in personal lives outside organizations. Social networking and other phenomenological behavior come into play.

Ideation

Ideation is an active, fast-moving collaborative group process for forming ideas for design. It is an activity that goes with design thinking; you might say that ideation is a tool of design thinking; ideation is applied design thinking. Ideation is where you start your conceptual design.

Iterate to explore:

- Ideation involves exploration and calls for extensive iteration. Be ready to try, try, try, and try again. Think about Thomas Edison and his more than 10,000 experiments to create a usable and useful light bulb.
- Make sketches and physical mock-ups early and often, and expose customers and users to your designs; involve them in their creation, exploration, and iteration.

Idea creation vs. Critiquing

- Idea creation is about the generation of new ideas and throwing them out for discussion and inspiration. Critiquing is review and judgment.
- Although you will interweave idea creation and critiquing throughout the design process, you should know which mode you are in at any given time and not mix the modes.
- Idea creation gives a new creative idea time to blossom before it is cut at the stem and held up to the scale. Idea creation gives you permission to be radical; you get to play outside the safe zone and no one can shoot you down.

Doing Ideation

- **Set up work spaces:** Set aside physical work spaces for ideation, individual work, and group work. Establish a place for design collaboration.
- If possible, arrange for dedicated ideation studio space that can be closed off from outside distractions, where sketches and props can be

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posted and displayed, and that will not be disturbed by time-sharing with other meetings and work groups.

- **Assemble a team:** Why a team? The day of the lone genius inventor is long gone, as is the die-hard misconception of the disheveled genius inventor flailing about in a chaotic frenzy in a messy and cluttered laboratory.
- So, gather a creative and open-minded team. You might think that only a talented few brilliant and inventive thinkers could make ideation work successfully.
- **Use ideation bin ideas to get started:** If you gathered ideation inputs into a "bin" of work activity notes back in contextual analysis, now is the time to use them.
- An ideation input bin is an unconstrained and loosely organized place to gather all the work activity notes and other ideas for sparking and inspiring design.
- **Brainstorm:** Ideation is not just sketching, it is brainstorming, brainstorming is a "conference technique of solving specific problems, amassing information, stimulating creative thinking, developing new ideas, etc., by unrestrained and spontaneous participation in discussion." Ideation is classic brainstorming applied to design.

SKETCHING

Sketching is the rapid creation of freehand drawings expressing preliminary design ideas, focusing on concepts rather than details.

- **Sketching is essential to ideation and design:** Design is a process of creation and exploration, and sketching is a visual medium for that exploration. By adding visualization to ideation, sketching adds cognitive supercharging, boosting creativity by bringing in more human senses to the task.
- Clearly sketching supports communication within ideation and points out, sketches also serve as an important longer-term design documentation. This helps other team members and designers retain understanding of the design and its details as they get into

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prototyping and implementation. The evolution of your sketches provides a history of your thinking.

- **What sketching is and is not:** Sketching is not about putting pen to paper in the act of drawing. A sketch is not about making a drawing or picture of a product to document a design. A sketch is a medium to support a conversation among the design team members.
- **Sketches are not the same as prototypes:** Sketches are not prototypes, at least not in the usual UX process sense. Sketches are not used to refine a design that has been chosen.
- Sketches are for exploring the possibilities for creating a design. Sketching is designing, whereas prototyping in the usual sense is implementation to build a concrete design representation for testing.
- **Doing Sketching**
- Stock the ideation studio with sketching supplies such as whiteboards, blackboards, corkboards, flip chart easels, Post-itsTM of all sizes, tape, and marking pens.
- **Use the language of sketching**
- To be effective at sketching for design, you must use a particular vocabulary. One of the most important language features is the vocabulary of lines, which are made as freehand "open" gestures. Instead of being mechanically correct and perfectly straight, lines in sketches are roughed in and not connected precisely.
- **Characteristics of Sketch:** Everyone can sketch; you do not have to be artistic
- Most ideas are conveyed more effectively with a sketch than with words
- Sketches are quick and inexpensive to create; they do not inhibit early exploration
- Sketches are disposable; there is no real investment in the sketch itself
- Sketches are timely; they can be made just-in-time, done in-the-moment, provided when needed

MORE ABOUT PHENOMENOLOGY
- **The Nature of Phenomenology**

- Joy of use is an obvious emotional counterpart to ease of use in interaction. But there is a component of emotional impact that goes much deeper. Think of the kind of personal engagement and personal attachment that leads to a product being invited to become an integral part of the user's lifestyle.
- More than functionality or fun this is a kind of companionship. This longer-term situated kind of emotional impact entails a phenomenological view of interaction.
- **The Phenomenological View in Human–Technology Interaction**
- When translated to human–computer interaction, phenomenological aspects of interaction represent a form of emotional impact, an affective state arising within the user.
- It is about emotional phenomena within the interaction experience and the broadest interpretation of the usage context. It is about a social role for a product in long-term relationships with human users.
- **The Phenomenological Concept of Presence**
- Presence of a product is a kind of relationship with users in which the product becomes a personally meaningful part of their lives.
- Presence of a product is a kind of relationship with users in which the product becomes a personally meaningful part of their lives.
- **The Importance of Phenomenological Context over Time**
- Phenomenological aspects of emotional impact are about a deeper and longer term concept. It is not just about a point in time within usage, but it speaks to a whole style and presence of the product over time.
- The realization of this fact is essential in both design and evaluation for emotional impact within the phenomenological context.
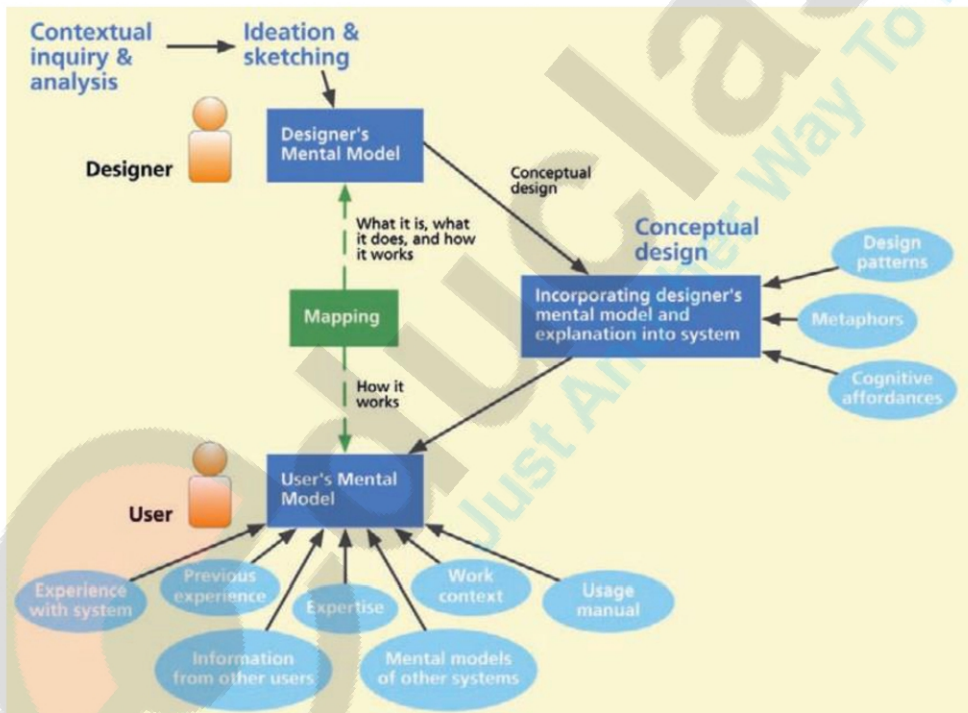
MENTAL MODELS

A mental model is an explanation of someone's thought process about how something works in the real world." A designer's mental model is a vision of how a system works as held by the designer. A user's mental model is a description of how the system works, as held by the user. It is the job of conceptual design (coming up soon) to connect the two.

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Designer's Mental Model

- Sometimes called a conceptual model, the designer's mental model is the designer's conceptualization of the envisioned system—what the system is, how it is organized, what it does, and how it works.
- If anyone should know these things, it is the designer who is creating the system. But it is not uncommon for designers to "design" a system without first forming and articulating a mental model.
- The results can be a poorly focused design, not thought through from the start. Often such designs proceed in fits and starts and must be retraced and restarted when missing concepts are discovered along

the way.

- **Designer's mental model in the ecological perspective:** Describing what the system is, what it does, and how it works within its ecology

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- In the ecological perspective, a designer's mental model is about how the system or product fits within its work context, in the flow of activities involving it and other parts of the broader system.
- **Designer's mental model in the interaction perspective:** Describing how users operate it.
- In the interaction perspective, a designer's mental model is a different view of an explanation of how things work; it is about how a user operates the system or product.
- It is a task-oriented view, including user intentions and sensory, cognitive, and physical user actions, as well as device behavior in response to these user actions.
- **Designer's mental model in the emotional perspective: Describing intended emotional impact:** In the emotional perspective, the mental model of a design it about the expected overarching emotional response.

User's Mental Model

- A user's mental model is a conceptualization or internal explanation each user has built about how a particular system works.
- We look for cause-and-effect relationships and form theories to explain what we observe and why, which then helps guide our behavior and actions in task performance.
- But sometimes mental models adapted from previous encounters with similar systems can work against learning to use a new system with a different conceptual design.
- Lack of a correct user mental model can be the stuff of comedy curve balls, too.

Conceptual Design

- A conceptual design is the part of an interaction design containing a theme, notion, or idea with the purpose of communicating a design vision about a system or product. A conceptual design is the manifestation of the designer's mental model within the system.
- Conceptual design is where you innovate and brainstorm to plant and first nurture the user experience seed. You can never iterate the

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design later to yield a good user experience if you do not get the conceptual part right up front.

- Conceptual design is where you establish the metaphor or the theme of the product in a word, the concept.

Start with a Conceptual Design

- Now that you have done your contextual inquiry and analysis, requirements, and modeling, as well as your ideation and sketching, how do you get started on design? Many designers start sketching out pretty screens, menu structures, and clever widgets.
- To get started on conceptual design, gather the same team that did the ideation and sketching and synthesize all your ideation and sketching results into a high-level conceptualization of what the system or product is, how it fits within its ecology, and how it operates with users.

Leverage Metaphors in Conceptual Design

- **Metaphors in the ecological perspective:** Find a metaphor that can be used to describe the broader system structure. An example of a metaphor from the ecological perspective could be the description of iTunes as a mother ship for iPods, iPhones, and iPads.
- The intention is that all operations for adding, removing, or organizing media content, such as applications, music, or videos, are ultimately managed in iTunes and the results are synced to all devices through an umbilical connection.
- **Metaphors in the interaction perspective:**
- An example of a metaphor in the interaction perspective is a calendar application in which user actions look and behave like writing on a real calendar.
- A more modern example is the metaphor of reading a book on an iPad. As the user moves a finger across the display to push the page aside, the display takes on the appearance of a real paper page turning.

Conceptual design in the ecological perspective

- The purpose of conceptual design from the ecological perspective is to communicate a design vision of how the system works as a black box within its environment.

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- The ecological conceptual design perspective places your system or product in the role of interacting with other subsystems within a larger infrastructure.

Conceptual design in the interaction perspective

- The conceptual design from the interaction perspective is used to communicate a design vision of how the user operates the system.

Conceptual design in the emotional perspective

- Conceptual design from the emotional perspective is used to communicate a vision of how the design elements will evoke emotional impact in users.
- Returning to the car example, the design concept could be about jaw-dropping performance and how your heart skips a beat when you see its aerodynamic form or it could be about fun and being independent from the crowd.

WIREFRAMES

In Figure we show the path from ideation and sketching, task interaction models, and envisioned design scenarios to wireframes as representations of your designs for screen layout and navigational flow.
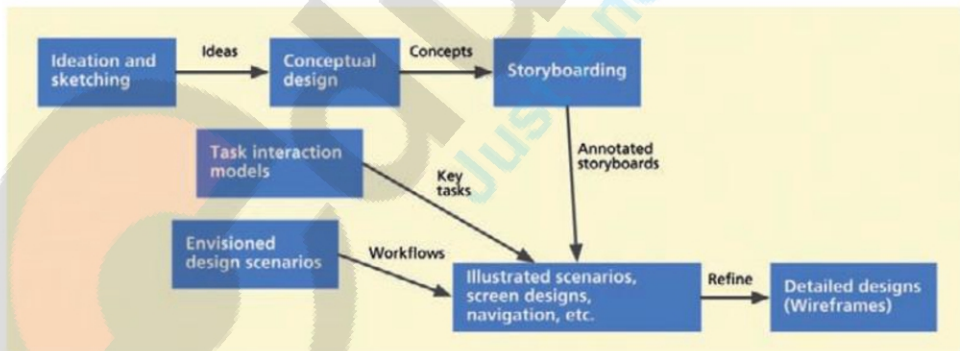
What Are Wireframes?

- Wireframes, a major bread-and-butter tool of interaction designers, are a form of prototype, popular in industry practice. Wireframes comprise lines and outlines (hence the name "wire frame") of boxes and other shapes to represent emerging interaction designs.

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- They are schematic diagrams and "sketches" that define a Web page or screen content and navigational flow. They are used to illustrate high-level concepts, approximate visual layout, behavior, and sometimes even look and feel for an interaction design.

How Are Wireframes Used?

- Wireframes are used as conversational props to discuss designs and design alternatives. They are effective tools to elicit feedback from potential users and other stakeholders.
- A designer can move through a deck of wireframes one slide at a time, simulating a potential scenario by pretending to click on interaction widgets on the screen. These page sequences can represent the flow of user activity within a scenario, but cannot show all possible navigational paths.
- While this takes more effort to create, and even more to maintain as the deck changes, it provides a more realistic representation of the envisioned behavior of the design.
- Finally, after the design ideas are iterated and agreed upon by relevant stakeholders, wireframes can be used as interaction design specifications. When wireframes are used as inputs to design production, they are annotated with details to describe the different states of the design and widgets, including mouse-over states, keyboard inputs, and active focus states.

How to Build Wireframes?

- Wireframes can be built using any drawing or word processing software package that supports creating and manipulating shapes, such as iWork Pages, Keynote, Microsoft PowerPoint, or Word.
- Take each box and start fleshing out the design details. What are the different kinds of interaction needed to support each part of the design, and what kinds of widgets work best in each case?
- As you flesh out all the major areas in the design, be mindful of the information architecture on the screen.
- Next it is time to think about sequencing. If you are representing a workflow, start with the "wake-up" state for that workflow.
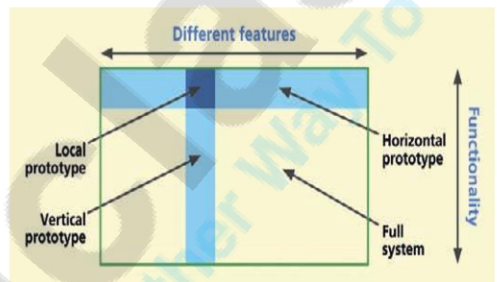
Prototyping

A prototype gives you something to evaluate before you have to commit resources to build the real thing. Because prototyping provides an early version of the system that can be constructed much faster and is less expensive, something to stand instead of the real system to evaluate and inform refinement of the design, it has become a principal technique of the iterative lifecycle.

DEPTH AND BREADTH OF A PROTOTYPE

The idea of prototypes is to provide a fast and easily changed early view of the envisioned interaction design.

- **Horizontal vs. Vertical Prototypes**

A horizontal prototype is very broad in the features it incorporates, but offers less depth in its coverage of functionality. A vertical prototype contains as much depth of functionality as possible in the current state of progress, but only for a narrow breadth of features.

- A vertical prototype contains as much depth of functionality as possible in the current state of progress, but only for a narrow breadth of features.
- A horizontal prototype is a good place to start with your prototyping, as it provides an overview on which you can base a top-down approach.
- A vertical prototype allows testing a limited range of features but those functions that are included are evolved in enough detail to support realistic user experience evaluation.

- **"T" Prototypes**
- A "T" prototype combines the advantages of both horizontal and vertical, offering a good compromise for system evaluation.
- Much of the interface is realized at a shallow level (the horizontal top of the T), but a few parts are done in depth (the vertical part of the T).

- This makes a T prototype essentially a horizontal prototype, but with the functionality details filled out vertically for some parts of the design.
- **Local Prototypes**
- We call the small area where horizontal and vertical slices intersect a "local prototype" because the depth and breadth are both limited to a very localized interaction design issue.

FIDELITY OF PROTOTYPES

- **Low-Fidelity Prototypes**
- Low-fidelity prototypes are appropriate when design details have not been decided or when they are likely to change and it is a waste of effort and maybe even misleading to try and flesh out the details.
- Because low-fidelity prototypes are sometimes not taken seriously, the case for low-fidelity prototyping, especially using paper, bears some explaining.
- **Medium-Fidelity Prototypes**
- Sometimes you need a prototype with a level in between low fidelity and high fidelity.
- Sometimes you have to choose one level of fidelity to stick with because you do not have time or other resources for your prototype to evolve from low fidelity to high-fidelity.
- **High-Fidelity Prototypes**
- In contrast, high-fidelity prototypes are more detailed representations of designs, including details of appearance and interaction behavior.
- High-fidelity is required to evaluate design details and it is how the users can see the complete (in the sense of realism) design.

INTERACTIVITY OF PROTOTYPES

- The amount of interactivity allowed by a prototype is not independent of the level of fidelity. In general, high interactivity requires high-fidelity.
- **Scripted and "Click-Through" Prototypes**
- The first prototypes to have any "behavior," or ability to respond to user actions, are usually scripted prototypes, meaning programmed with a scripting language.
- **A Fully Programmed Prototype**

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- Even the prototypes of large systems can themselves be large and complex. On rare occasions and in very special circumstances, where time and resources permit and there is a genuine need, a project team is required to produce a high- fidelity full-system operational prototype of a large system, including at least some back-end functionality.

CHOOSING THE RIGHT BREADTH, DEPTH, LEVEL OF FIDELITY, AND AMOUNT OF INTERACTIVITY

- **Using the Right Level of Fidelity for the Current Stage of Progress**
- In general, low-fidelity prototypes are a tool to be used within the project team. If low-fidelity prototypes are shown casually around to users and customer personnel without careful explanation, they can be misinterpreted.
- **A progression of increasing fidelity to match your stage of progress**
- As a general rule, as you move through stages of progress in your project, you will require increasing levels of fidelity in your prototypes.

Prototyping for the ecological perspective

- The ecological design perspective is about how the system or product works within its external environment. It is about how the system or product is used in its context and how the system or product interacts or communicates with its environment in the process.
- To support exploration of the high-level system structure, a prototype in the ecological perspective is a kind of concept map to how the different parts of the system will work at the conceptual level and how it fits in with the rest of the world—other systems and products and other users.

Prototyping for the interaction perspective

- The interaction design perspective is about how users operate the system or product. It is a task and intention view, where user and system come together.

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- It is where users look at displays and manipulate controls, doing sensory, cognitive, and physical actions. Use medium-fidelity prototypes, such as wireframes, to flesh out behavior, including sequencing and responses to user actions.

Prototyping for the emotional perspective

- The emotional design perspective is about emotional impact and value- sensitive aspects of design. It is about social and cultural implications, as well as the aesthetics and joy of use.
- High fidelity and high interactivity are usually required to support this perspective. Although full details at the interaction level may not always be required, you do need details relating to fun, joy of use, and user satisfaction.

In sum, prototypes have these advantages:

- Offer concrete baseline for communication between users and designers
- Provide conversational "prop" to support communication of concepts not easily conveyed verbally
- Allow users to "take the design for a spin" (who would buy a car without taking it for a test drive or buy a stereo system without first listening to it?)
- Give project visibility and buy-in within customer and developer organizations
- Encourage early user participation and involvement
- Give impression that design is easy to change because a prototype is obviously not finished
- Afford designers immediate observation of user performance and consequences of design decisions
- Help sell management an idea for new product
- Help affect a paradigm shift from existing system to new system

INTERACTION DESIGN SPECIFICATIONS

- **What Is an Interaction Design Specification?**
- Interaction design specifications are descriptions of user interface look and feel and behavior at a level of completeness that will allow a software programmer to implement it precisely.

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- Discussions of "specifications" often lead to a diversity of strongly felt opinions. By definition, a specification is a complete and correct description of something.

- **Why Should We Care about Interaction Design Specifications?**

- The user interaction design on the UX side becomes the user interface software requirements for the user interface software design on the SE side.

- In simple terms, we UX folks need a design representation because the SE folks need a requirements specification for the user interface software. You want it to be a very specific specification so there is no room for the SE people to do interaction design on their own.

- **What about Using a Prototype as a Design Specification?**

- The case for prototypes as interaction design representations is built on the fact that prototypes already exist naturally as concrete, living design representations. Plus, prototypes capture all that design detail in a way that no descriptive kind of representation can.

- It is especially easy to view an iteratively refined and relatively complete high-fidelity prototype as a wonderfully rich and natural way to represent an interaction design. However, while prototypes make for good demonstrations of the design, they are not effective as reference documents.