Module_3

Design Process Of User Interface

CS 4712 User Interface Engineering

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What is the Design Process of User Interface?

- The process of user interface design is to create and implement interfaces in software or computerized devices with a focus on looks, style, and usability.
- **A designer must take appropriate steps with the goal in mind to create designs** that users will find easy to use and pleasurable.

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4 Basic Activities of UI Design Process

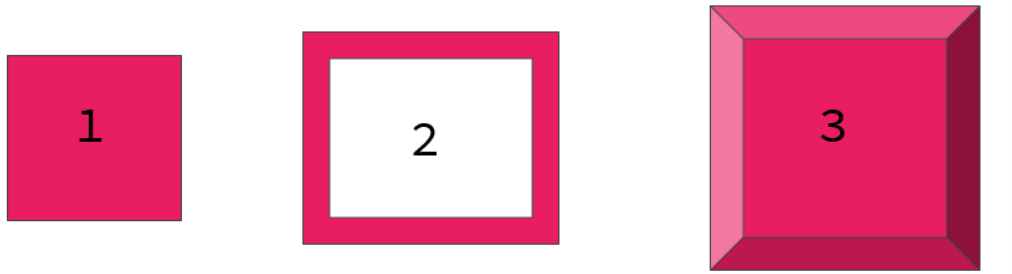
- ✓ **Requirements**
- ✓ Designing Alternatives
- ✓ Prototyping
- ✓ Evaluating

- When establishing requirements, it is vital to know who the intended users are.
- This development involves a lot of gathering of data.

4 Basic Activities of UI Design Process

- ✓ Requirements
- ✓ **Designing Alternatives**
- ✓ Prototyping
- ✓ Evaluating

- After the gathering phase the developer begins creating designs and alternatives based on requirements.



4 Basic Activities of UI Design Process

- ✓ Requirements
- ✓ Designing Alternatives
- ✓ **Prototyping**
- ✓ Evaluating

- The prototyping phase is where an actual functioning interface is developed for testing and evaluation.
- A prototype allows for interaction and testing of usability

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4 Basic Activities of UI Design Process

- ✓ Requirements
- ✓ Designing Alternatives
- ✓ Prototyping
- ✓ **Evaluating**

- Evaluation defines the capabilities and competence of the design that is assessed in relation to variation of usability and the overall user experience based on the initial requirements and conditions

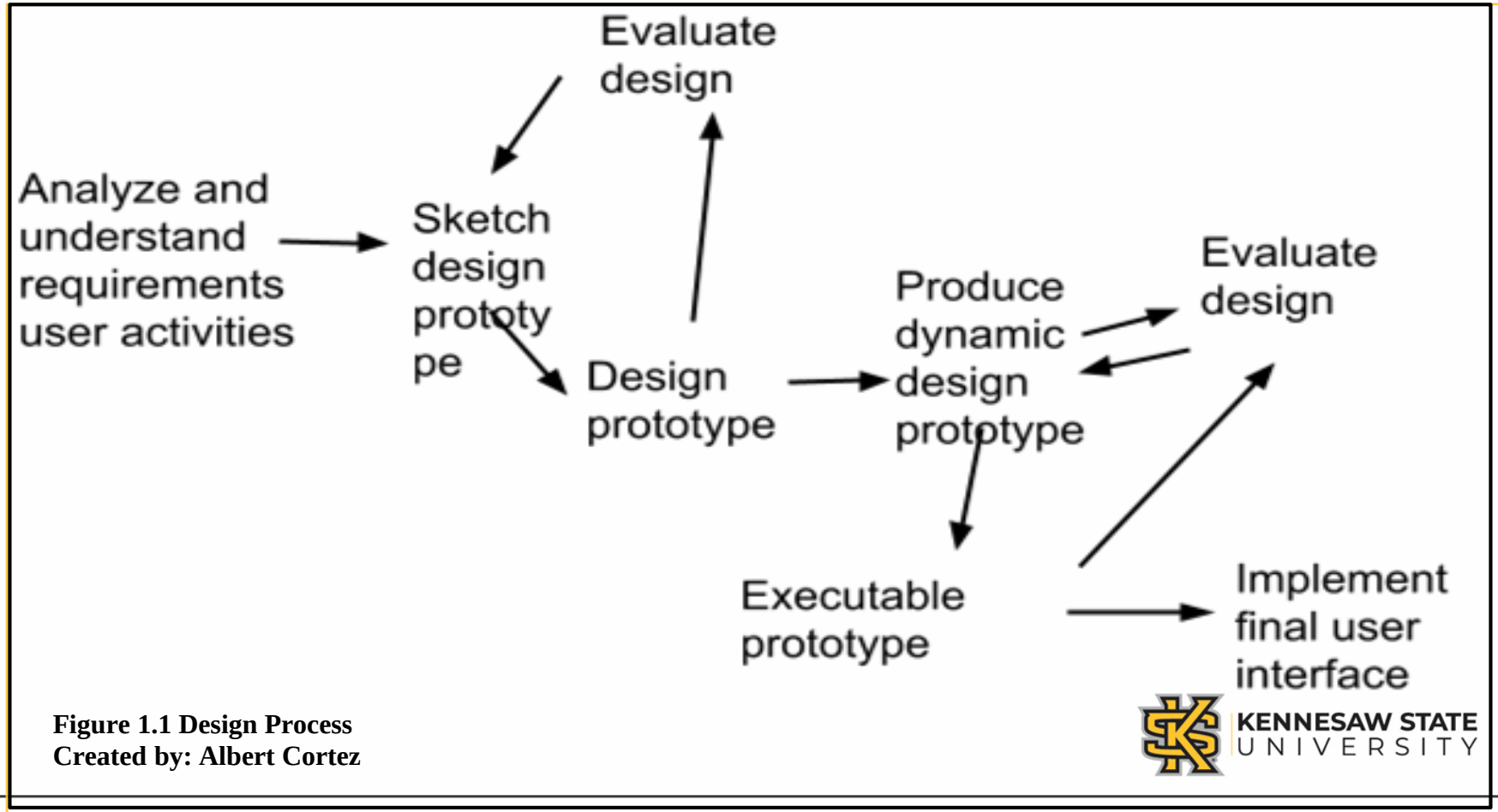

Figure 1.1 Design Process
Created by: Albert Cortez

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UI Design Process

Key Components

- Analyze Requirements
- Sketch Design
- Evaluate Design
- Prototype
- Test Design
- Modify Design
- Implement

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UI Design Process

Psychological And Physical Features Of User

- Analyzing the psychological and physical needs of the user.
- Different types of users will have different needs
  - **Example**, an interface meant to be accessible by children would need to be much more simplistic than one designed for a business

User Interface (UI) Design of Scheduling Activity Apps for Autistic Children

- Study focused on interface design for mid-high functioning autistic children and their parents.
- UI would schedule daily activities.
- *Autistic Children often struggle to understand concepts around time management*.
- **User Centered Design** (UCD) - Focuses on designing around the user rather than the function of the interface.

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UI Design Process

First Steps

User Interface (UI) Design of Scheduling Activity Apps for Autistic Children

- Interview Parents of children with autism
- Begin creating framework to structure research.
- One issue that was brought up is that if the children did not understand the schedule the first time seeing it, they would break down in a fit of stress or panic.

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UI Design Process

Identify medium for UI

User Interface (UI) Design of Scheduling Activity Apps for Autistic Children

- Through interviews with parents and outside studies, smartphones were identified as the best median.
- An external study cited ""Many children with autism have a keen interest in smartphones because they are accustomed to watching movies and playing games on smartphones and they find something that makes them feel good."

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UI Design Process

Testing

User Interface (UI) Design of Scheduling Activity Apps for Autistic Children

- **Testing done** by almost entirely by the intended users.
- **Quality in Use Integrated Measurement (QUIM)**
- **Reviewing** how effective the users are at performing the features of the interface
- **First testing phase** found that parents had issues creating new activities in the study.
- **verifying** that the system is satisfied.
- **Applying** fixes based off the feedback and retesting until the level of required fixes goes below a certain threshold.

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UI Design Process

Information-Matter-Energy Model

- looks to the real world
  - to study how information is processed.
  - we have real physical objects and then the abstract forces acting on them.
- A person may see an object that looks familiar to them, and they will believe it to behave similarly to other similar objects.
- They are unaware of abstract details of the object like weight/temperature but assume based off of similarities.
- Same ideas of cognition apply when a user is attempting to learn how to use a UI

UI Design Process

Object-Attribute-Relation model

- Human memory functions through relational metaphors rather than container metaphors
- Thought is derived from comparing similar objects rather than the object on its own.
- Expands on the ideas of the information-matter-energy model

UI Design Process

Lane Departure Warning Systems Study

- A study was done in 2016 at The Pediatric Neuro-rehabilitation Research Center, University of Social Welfare & Rehabilitation Sciences in Tehran, Iran to research the effectiveness of lane departure warning systems (LDWS);
- New systems added to cars every year
- Symbols must convey a function to a user that has never seen them before.

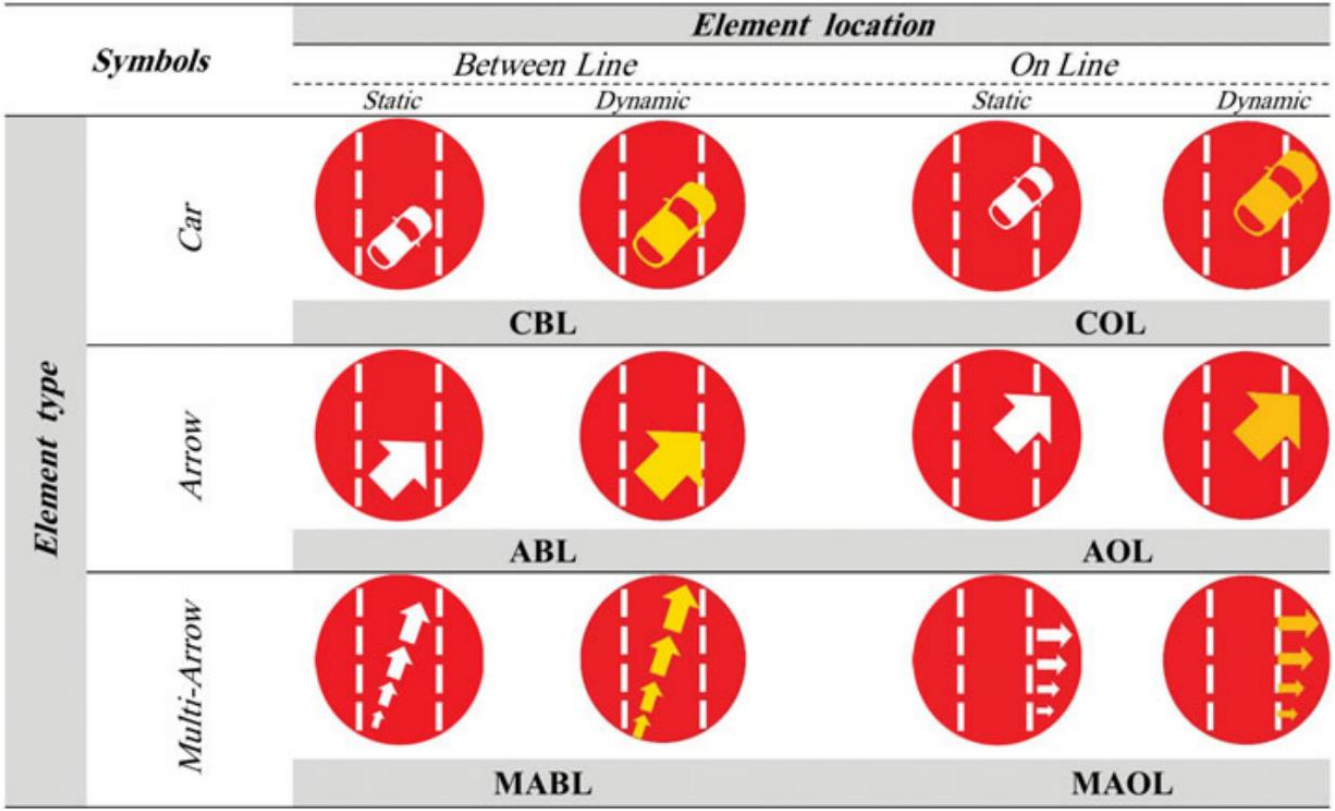
UI Design Process

Five Categories to Study

Lane Departure Warning System Study

- **Simplicity** - analyzes the amount of elements and the detail of those elements
- **Familiarity** - the symbols mean the same thing throughout all of their functions
- **Concreteness** - objects having real world comparisons
- **Meaningfulness** - how multiples elements can have meaning alongside each other
- **Semantic closeness** - Describes how proximity of elements from each other can create an assumed function

Prototype Designs



Maddahi, H., Pouyakian, M., Ghomsheh, F., Piri, L., & Osqueizadeh, R. (2016). Design and cognitive evaluation of dynamic lane departure warning symbols. *Traffic Injury Prevention,17*(8), 842-847.

Research Questions

- **Writing a Research Question**
  - ✓ Specify your specific concern or issue.
  - ✓ Decide what you want to know about the specific concern or issue.
  - ✓ Turn what you want to know and the specific concern into a question.
  - ✓ Ensure that the question is answerable.
  - ✓ Check to make sure the question is not too broad or too narrow.

- **Steps to developing a research question:**

✓ Choose an interesting general topic.

- ✓ Most professional researchers focus on topics they are genuinely interested in studying. ...
- ✓ Do some preliminary research on your general topic. ...
- ✓ Consider your audience. ...
- ✓ Start asking questions. ...
- ✓ Evaluate your question. ...
- ✓ Begin your research.

What are the 3 types of research questions?

Most research can be divided into three different categories;

1. exploratory,
2. descriptive
3. and causal.

Each serves a different end purpose and can only be used in certain ways.

What is a good research question?

A **research question** is a clear, focused, concise, complex and arguable **question** around which you center your **research**. ... The specificity of a well-developed **research question** helps writers avoid the “all-about” paper and work toward supporting a specific, arguable thesis.

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Research Questions

Sample_1

- Here is the Sample Paper
  Full Paper link:

2.2.4 Sense of Presence Questionnaire

This survey attempts to measure your sense of presence (your depth of immersion) in the virtual world using a similar scale as Part I.

1. When you removed the head mounted display, how surprised were you at the direction you were facing?
2. During the immersion, how aware were you of the direction you faced in the real world?
3. How often did you think of the other person(s) in the real world with you?
4. How much more enjoyable would it have been to have the immersion experience with no one else in the room?
5. When you turned your back on an object in the virtual environment, was it still there?
6. How flat and missing in depth did the virtual reality world appear?
7. How exhilarated did you feel after the experience?
8. How disoriented did you feel after the experience?
9. Rate your sense of presence in the virtual world during the experiment (using both scales).
10. Rate your sense of presence in the real world while experiencing the virtual world (using both scales).

Research Questions - Sample_2

The experimental instruments included

Pre-Experiment questionnaire (*selected questions*):

1. *How would you rate your current knowledge of AR technology?*
2. *How easy is to use AR technology?*
3. *How do you feel about the usage of AR technology to gather data versus the traditional 2D environment?*
4. *Do you believe data could be easier to comprehend with the usage of AR technology?*
5. *How much difficulty do you believe you would have working with AR technology over using an Android device?*

Post-Experiment questionnaire (*selected questions*):

1. *How easy was it for you to use the HoloLens?*
2. *To what extent did you comprehend the streaming data shown?*
3. *Do you believe there was a benefit in incorporating AR technology?*
4. *Preference - Augmented Reality 3D display of data versus Traditional 2D display of streaming data.*
5. *For AR display, do you prefer one device to another?*

Here is the full paper Link

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Research Questions & Hypothesis - Sample_3

- Here is the Sample paper Web Link:
- The questionnaire included questions that were administered the participants for each specific game and are as follows:
  1. You have experience with the video game League of Legends, Chivalry Warfare, and Guild Wars
  2. You believe it took you a short amount of time to understand and operate the games interface.
  3. You believe the number of buttons required to play the game was overwhelming?
  4. You believe the amount of time given to you was enough to learn the specified commands.

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Hypothesis

- Means a theory or proposed explanation made on the basis of limited evidence as a starting point for further investigation.
- In science, a **hypothesis** is an idea or **explanation** that you then test through study and experimentation.
- Outside science, a theory or guess can also be called a **hypothesis**.
- A **hypothesis** is something more than a wild guess but less than a well-established theory.

Hypothesis Example

- **Examples** of an If, Then **Hypothesis**
- If you get at least 6 hours of sleep, you will do better on tests than if you get less sleep. If you drop a ball, it will fall toward the ground. If you drink coffee before going to bed, then it will take longer to fall asleep.
- A **good hypothesis** relates an independent variable and a dependent variable. ...

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Hypothesis & Null Hypothesis

- A hypothesis is an explanation for a set of observations. Here are examples of a scientific hypothesis.
- Although you could state a scientific hypothesis in various ways, most hypotheses are either "If, then" statements or else forms of the null hypothesis.
- The **null hypothesis** sometimes is called the "no difference" hypothesis.
- Take a look at the Sample Papers Here is the Sample paper Web Link:
  - **Research Question**: *Is there a significant difference between the players' gaming experiences using interfaces ranging from simplistic to complex?*
  - **Null Hypothesis**: *There is no significant difference between the players' gaming experiences using interfaces ranging from simplistic to complex.*

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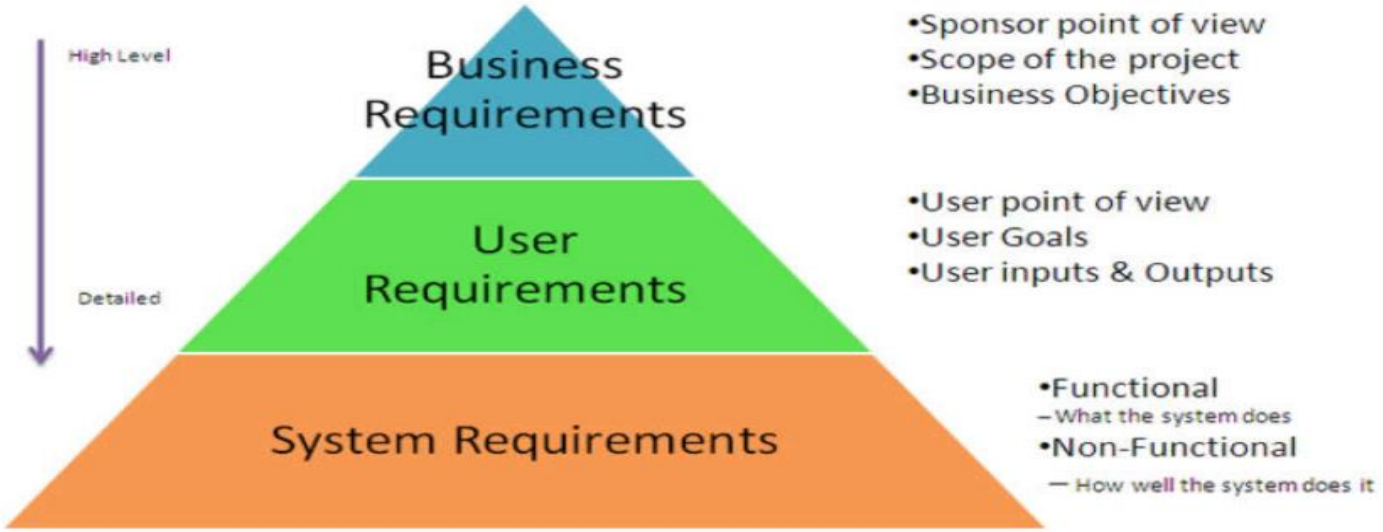
What are Requirements?

A **requirement** is a statement about an intended product that specifies what it should do or how to do it. For requirements to be effectively implemented and measured, they must be specific, unambiguous and clear. For example, a requirement may be that a specific button must enable printing of the contents of the current screen.



Diagrammatic representation of the different types of requirements (Source: SatheesPractice)

Since this article focuses on requirements gathering of systems, we will focus on the two types of **System Requirements**:

Theoretical Frameworks for Cognition

Theoretical Frameworks for Cognition

- Studies like this lay out the process to establish a framework
- Should be unique based of the intended user
- Determines best options to determine what the user is capable of learning and how they best learn
- Ensures that the design can be understood by as many people as is possible

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Theoretical Frameworks for Cognition

- Involves creating a structure of ideas to support research or study.
- Humans are complex beings; each one will process information and solve problems in their own unique ways
- Requires understanding of human cognition.
- Framework is designed to determine cognitive abilities of intended users

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