

**Course : COMP6176 / Human - Computer
Interaction**

Year : 2019

UNDERSTANDING AND CONCEPTUALIZING INTERACTION

SESSION 02

LEARNING OUTCOMES

- LO 1: Describe the concept of interaction design
- LO 2: Use guidelines, principles, models, and framework related with interaction design

OUTLINE

- Introduction
- Conceptualizing Interaction
- Conceptual Models
- Interface Metaphor
- Interaction Types
- Paradigms, Visions, Theories, Models and Frameworks

INTRODUCTION

- **How would you start** if asked to design an application to enable people to share their photos, movies, photo, chats, documents in an efficient, safe, and enjoyable way.
- **Would you begin by sketching out** how the interface might look, work out how the system architecture should be structured or simply start coding ?
- **Would you start by asking users** about their current experiences of sharing files and look existing tools , begin thinking about why and how you were going to design the application

INTRODUCTION

- It is important for Interaction Designer to realize that **having a clear understanding of why and how you are going to design something** , before writing any code.
- It can save enormous amounts of time, effort, and money later on in the design process.

CONCEPTUALIZING INTERACTION

- When beginning a design project, it is important to be clear about the underlying assumptions and claims. By an assumption, we mean taking something for granted that requires further investigation
- for example, people now want an entertainment and navigation system in their cars.
- Writing down your assumptions and claims and then trying to defend and support them can highlight those that are vague or wanting. In so doing, poorly constructed design ideas can be reformulated.

CONCEPTUALIZING INTERACTION

- The following framework is intended to provide a set of core questions to aid design teams in this process:
 - Are there problems with an existing product or user experience? If so, what are they?
 - Why do you think there are problems?
 - What evidence do you have to support the existence of these problems?
 - How do you think your proposed design ideas might overcome these problems?

CONCEPTUALIZING INTERACTION (Your Turn)

- Use the framework in the previous list to guess what the main assumptions and claims were behind 3D TV. Then do the same for curved TV, which was designed to be bendy so as to make the viewing experience more immersive. Are the assumptions similar? Why were they problematic?

CONCEPTUAL MODELS

What is Model ?

- A model is a simplified description of a system or process that helps describe how it works

CONCEPTUAL MODELS

- A conceptual model is the designer's intended mental model for the user of the system: a set of ideas about how it is organized and operated.
- Norman (1986) called this the design model:

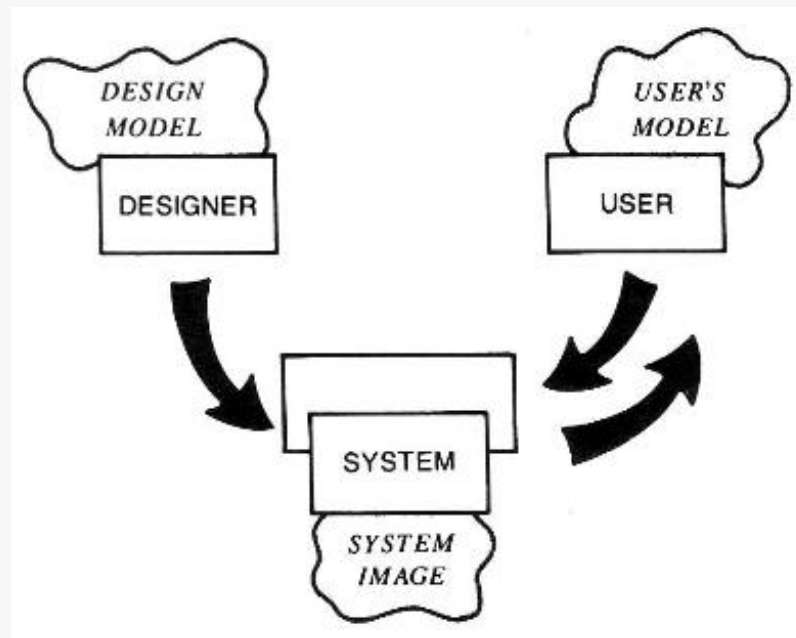


Figure 02.01 The Star Interfaces

CONCEPTUAL MODELS

- **A conceptual model** provides a working strategy and a framework of general concepts and their interrelations.
- The core components are :
 - **Metaphors and analogies** that convey to people how to understand what a product is for and how to use it for an activity. (ex browsing, bookmarking)
 - **The concepts** that people are exposed to through the product, including the task-domain objects, the attributes, the operations. (ex saving, revisiting, organizing)
 - **The relationships** between those concepts
 - **The mappings** between the concepts and the user experience the product is designed to support or invoke (ex : one can revisit most

CONCEPTUAL MODELS

- Example of a conceptual model

A classic conceptual model : **The Xerox Star**

- ❖ The Star interface developed by Xerox back in 1981 revolutionized the way interfaces were designed for personal computing.
- ❖ It was designed as an office system, targeted at workers not interested in computing and was based on a conceptual model that included the familiar knowledge of an office.
- ❖ Papers, folders, filing cabinets, and mailboxes were represented as icons on the screen and were designed to possess some of the properties of their physical counterparts.

CONCEPTUAL MODELS

- Example of a conceptual model (continue) : The Star Interface (See Figure 02.02)

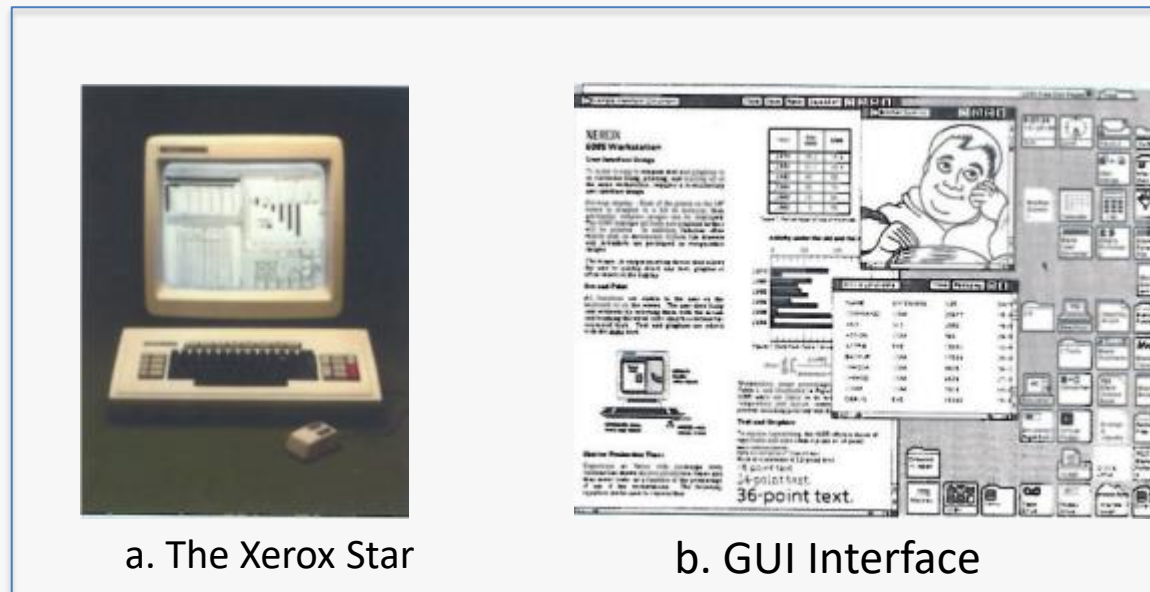


Figure 02.02 The Star Interfaces

INTERFACE METAPHOR

- **Interface metaphor :**
 - Intended to provide familiar entities that enable people to readily understand the underlying conceptual model and know what to do at an interface.
 - Designers can fall into the trap of trying to create a virtual object to resemble a familiar physical object that is itself badly designed.
 - A well-known example is **the virtual calculator**, which is designed to look and behave like a physical calculator.

INTERFACE METAPHOR

- In figure 02.03 the Mac calculator has simpler interface that supports a basic set of calculations which all that most people need to do.
- In figure 02.04 the design of Scientific calculator has even gone as far as replicating functions needing shift keys

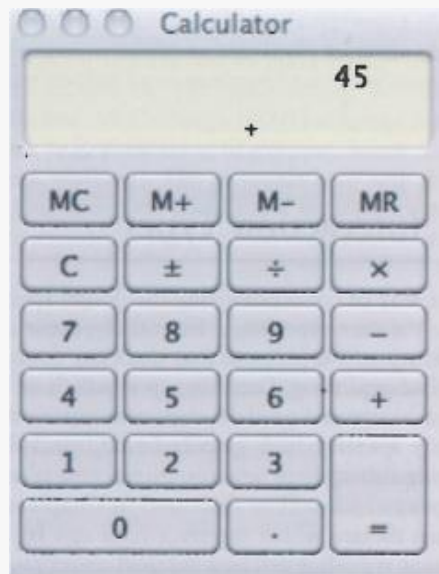


Figure 02.03 The Mac Calculator



Figure 02.04 Scientific Calculator

INTERFACE METAPHOR

- An interface metaphor that has become popular in the last few years is the card.
- Many of the social media apps, such as Facebook, Twitter, and Pinterest, present their content on cards

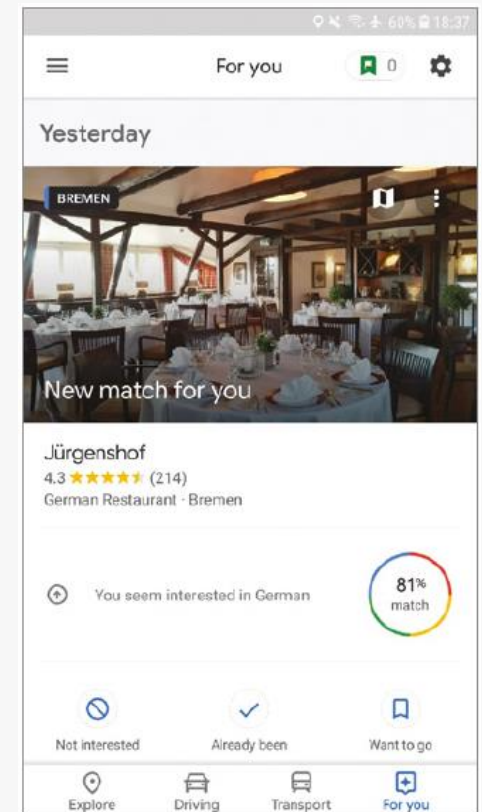


Figure 02.05 Google Now Card for restaurant recommendation in Germany

INTERACTION TYPES

- **Interaction Types** : there are the ways a person interacts with a product or application.
- There are **five main types** :
 1. Instructing
 2. Conversing
 3. Manipulating
 4. Exploring
 5. Responding

INTERACTION TYPES

INSTRUCTING

- This type of interaction describes how users carry out their tasks by telling the system what to do .
- This can be done in a number of ways, including :
 - ✓ Typing in commands
 - ✓ Selection options from menus
 - ✓ Speaking aloud commands
 - ✓ Gesturing
 - ✓ Pressing buttons or using a combinations of function keys

INTERACTION TYPES

INSTRUCTING

- Example :
 - ✓ Operating systems like Unix and Linux where users issue instruction at the prompt as a command or set of commands.
 - ✓ In Windows use control keys or the selection of menu options via a mouse, touch pad, touch screen

INTERACTION TYPES

- One the **main benefits of instruction** is :
 - ✓ The interaction is quick and efficient
 - ✓ It is particularly fitting where there is a need to frequently repeat actions performed on multiple objects.
 - ✓ Examples includes the repetitive actions of saving, deleting and organizing files.

INTERACTION TYPES

CONVERSING

- This form of interaction is based on the idea of a person having a conversation with a system, where the system acts as a dialog partner.
- The system is designed to respond in a way another human being might when having a conversations.
- It **differs** from the **activity of instructing** as it **encompasses a two-way communication process** with the system acting like a partner rather than a machine that obeys orders.

INTERACTION TYPES

CONVERSING

- The kind of conversation :
 - Simple voice-recognition
 - Menu-driven systems with via phones
 - More complex natural-language based systems that involve system parsing and responding to queries typed by the user.
- **The main benefit** uses a conversational style is : allow people especially novices, to interact with a system in a way that is familiar to them.

INTERACTION TYPES

CONVERSING

- The example :
 - ✓ The search engine Ask Jeeves for Kids
 - ✓ (www.askjeeves.com)
 - ✓ Online agents, Anna in IKEA help Center (www.ikea.com)
- A problem that can arise from using a conversational-based interaction type :
 - ✓ Certain kinds of task are transformed into cumbersome and one-sided interaction. Example : automated phone based systems

MANIPULATING

INTERACTION TYPES

- This form of interaction involves manipulating objects and capitalizes on users' knowledge of how they do so in the physical world. For example digital objects can be manipulated by moving, opening, holding, closing, placing)
- Actions that are not possible with objects in the real world such as zooming in and out, stretching and shrinking can done with this form of interaction.

INTERACTION TYPES

- **Direct Manipulation** : A framework that has been highly influential in informing the design of GUI application . (Sneiderman,1983).
- Direct manipulation interfaces are assumed to enable users to feel that they are directly controlling the digital objects represented by the computer.

INTERACTION TYPES

MANIPULATING

- **The three core principles** are :
 1. Continuous representation of the objects and actions of interest.
 2. Rapid reversible incremental actions with immediate feedback about the object of interest.
 3. Physical actions and button pressing instead of issuing commands with complex syntax.

INTERACTION TYPES

MANIPULATING

- The benefits of direct manipulation :
 - ✓ Helping beginners learn basic functionality rapidly.
 - ✓ Enabling experienced users to work rapidly
 - ✓ Allowing infrequent users to remember how to carry out operations over time
 - ✓ Preventing the need for error messages
 - ✓ Showing users immediately how their actions are furthering their goals
 - ✓ Reducing users' experience of anxiety
 - ✓ Helping users gain confidence and mastery and feel in control

INTERACTION TYPES

MANIPULATING

- Apple was one the first computer companies to design an operating environment that used direct manipulation as its central mode of interaction.
- Application that used direct manipulation interfaces such word processor, video games, leaning tools, and image editing tools.
- In particular, not all task can be described by objects and not all actions can be undertaken directly.

INTERACTION TYPES

EXPLORING

- This mode of interaction involves users moving through virtual or physical environments
- For example, users can explore aspects of a virtual 3D environment, such as the interior of a building.
- Similar to direct manipulation and direct manipulative, **the fundamental idea** is to enable people to explore and interact with an environment, be it physical or digital, by exploiting their knowledge of how they move and navigate through existing spaces.

EXPLORING

- Many 3D virtual environments have been built : virtual universities, virtual parties, Second LIFE (Figure 02.06).



Figure 02.06 Second Life

Source : www.ubernoggin.com

INTERACTION TYPES

RESPONDING

- This mode of interaction involves the system taking the initiative to alert, describe, or show the user something that it “thinks” is of interest or relevance to the context the user is presently in.
- Smartphones and wearable devices are becoming increasingly proactive in initiating user interaction in this way, rather than waiting for the user to ask, command, explore, or manipulate

INTERACTION TYPES

RESPONDING

- Example :

- a fitness tracker that notifies the user of a milestone they have reached for a given activity, for example, having walked 10,000 steps in a day.
- Google Lens, after taking a photo of a friend's cute dog in the park, Google Lens will automatically pop up information that identifies the breed of the dog (Figure 02.07)

INTERACTION TYPES

RESPONDING

•Example :



Figure 02.07 Google
Source : www.google.com

PARADIGMS, VISIONS, THEORIES, MODELS AND FRAMEWORKS

*Other sources of inspiration and knowledge that are used to inform design and guide research are paradigms, theories, models and frameworks
(Carroll, 2003)*

✓ A paradigm refers to a general approach that has been adopted by a community of researchers and designers for carrying out their work.

✓ **In the 1980s**, the prevailing paradigm in human computer interaction was how to design user-centered application for the desktop computer.

PARADIGMS, VISIONS, THEORIES, MODELS AND FRAMEWORKS

✓ 1980s :

- Task analytic and usability methods were developed based on individual user's cognitive capabilities
- The acronym WIMP (Window, Icons, Menus, and Pointer) was used as a way of characterizing the core features of an interface for a single user.
- It was later superseded by the GUI (Graphical User Interface).

PARADIGMS, VISIONS, THEORIES, MODELS AND FRAMEWORKS

✓ 1990s

- A big influence in the more recent paradigmatic changes was **Weiser's vision of ubiquitous technology**.
- Weiser proposed that computers would become part of the environment, embedded in a variety of everyday objects, devices, and displays.
- **Since the late 1990s** many researcher have been concerned with **how to embed and augment** the environment with various computational resources to provide information and services when and where desired.

PARADIGMS, VISIONS, THEORIES, MODELS AND FRAMEWORKS

- ✓ Visions of the future, like Mark Weiser's vision of ubiquitous technology, provide a powerful driving force that can lead to a paradigm shift in terms of what research and development is carried out in companies and universities.
- ✓ A current vision that has become pervasive is AI. Both utopian and dystopian visions are being bandied about on how AI will make our lives easier on the one hand and how it will take our jobs away on the other.

PARADIGMS, VISIONS, THEORIES, MODELS AND FRAMEWORKS

- ✓ Another challenge is to develop new kinds of interfaces and conceptual models that can support the synergy of humans and AI systems, which will amplify and extend what they can do currently.
- ✓ This could include novel ways of enhancing group collaboration, creative problem-solving, forward planning, policy-making, and other areas that can become intractable, complex, and messy, such as divorce settlements.

PARADIGMS, VISIONS, THEORIES, MODELS AND FRAMEWORKS

- ✓ Many new challenges, themes, and questions have been articulated through such visions, including the following:
 - ✓ How to enable people to access and interact with information in their work, social, and everyday lives using an assortment of technologies ?
 - ✓ How to design user experiences for people using interfaces that are part of the environment but where there are no obvious controlling devices ?
 - ✓ How and in what form to provide contextually relevant information to people at appropriate times and places to support them while on the move ?
 - ✓ How to ensure that information that is passed around via interconnected displays, devices, and objects is secure and trustworthy ?

PARADIGMS, VISIONS, THEORIES, MODELS AND FRAMEWORKS

- ✓ a theory is a well-substantiated explanation of some aspect of a phenomenon.
- ✓ For example : cognitive theories about human memory were used in the 1980s to determine the best ways of representing operations, given people's memory limitations.
- ✓ One of **the main benefits** of applying such theories in interaction design is :
 - To help identify factors (cognitive, social and affective) relevant to the design and evaluation of interactive products.

PARADIGMS, VISIONS, THEORIES, MODELS AND FRAMEWORKS

✓ **A Model** is a simplification of some aspect of human-computer interaction intended to make it easier for designer to predict and evaluate alternative designs.

✓ Example :

- Norman (1988) develop a number of models of user interaction based on theories of cognitive processing.
- Card, Moran, and Newell's keystroke model (1980) that used by a number of researchers and designers as a predictive way of analyzing user performance for different interfaces to determine which would be the most effective.

PARADIGMS, VISIONS, THEORIES, MODELS AND FRAMEWORKS

- ✓ **A Framework** is a set of interrelated concepts and / or a set of specific questions that is intended to inform a particular domain area, online communities, or an analytic method (e.g. ethnographic studies).
- ✓ **A Framework offers** advice to designers as to what to design or look for.
- ✓ **Framework based** on theories of human behavior, but increasingly being developed from the experiences of actual design practice and the findings arising from user studies.

PARADIGMS, VISIONS, THEORIES, MODELS AND FRAMEWORKS

✓ For example Table 2.1 shows part of a new framework proposed for human-computer interaction contrasting old and new concepts (Rogers, 2009)

Concern	Past	Future
Frame of reference	Users	context
Method, theory, perspective	<ul style="list-style-type: none"> - Scientific approach - Interaction design 	<ul style="list-style-type: none"> - Pluralistic - Mixing
Output	<ul style="list-style-type: none"> -Ethnographies -Models and tools for analysis -Design guidance 	<ul style="list-style-type: none"> -Insights -Creating new ways of experiencing -Value-based analyses

PARADIGMS, VISIONS, THEORIES, MODELS AND FRAMEWORKS

- ✓ The framework of Normans (1988) :
 - explication of the relationship between the design of a conceptual model and a user's understanding of it.
 - Comprises three interacting components :
 1. the designer's model
The model the designer has of how the system should work.
 2. The system image
how the system actually works is portrayed to the user through the interface, manuals, help facilities, and so on.

PARADIGMS, VISIONS, THEORIES, MODELS AND FRAMEWORKS

- Comprises three interacting components :
 - ✓ The user's model :
 - How the user understands how the system works.
- This framework makes explicit the relationship between how a system should function, how it is presented to users, and how it is understood by them.

PARADIGMS, VISIONS, THEORIES, MODELS AND FRAMEWORKS

- ✓ Recent framework in design practice is Garrett's (2010) user experience development process. (Figure 02.08)
- ✓ The framework has been used primarily to guide web development and understand the elements of the user experience.

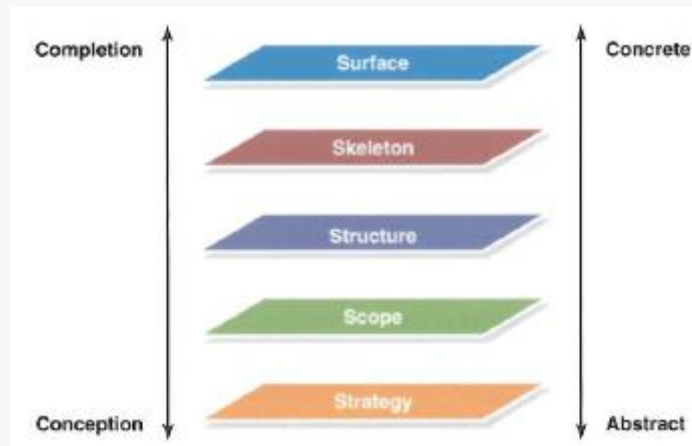


Figure 02.08 The user experience framework

- Interaction Design 5th Edition 2019, Chapter 3
- <http://www.inf.ed.ac.uk/teaching/courses/hci/1314/ecs/Lecture2.pdf>
- http://www.inf.ed.ac.uk/teaching/courses/hci/0809/ecs/4_models-4up.pdf
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