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# IT3180 – Introduction to Software Engineering

## 11 – User Experience

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### The importance of User Experience

A computer system is only as good as the experience it provides to its users

- If a system is hard to use:
  - Users may fail to find important results
  - They may give up
- Developing good user interfaces needs skill and time



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## Terminology

### User Experience (UX)

- The user experience is the total of all factors that contribute to the usability of a computer and its systems

### Human Computer Interaction (HCI)

- HCI is the academic discipline that studies how people interact with computers



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## Development Processes for User Interfaces

**It is almost impossible to specify an interactive or graphical interface in a written document**

- **Requirements** benefit from sketches, comparison with existing system
- **Designs** should include graphical elements and benefit from various forms of prototype
- User interfaces must be **tested with users**.
- Expect to change the requirements and design as the **result of testing**
- **Schedules** should include user testing and **time to make changes**



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## Prototypes

A prototype is a preliminary version that can be used to iterate rapidly between requirements and design

- **Paper prototype**
  - Quick sketches
- **Wireframe**
  - Online layout
- **Mock-up**
  - Graphical designs to show details of layout, colors, etc.
- **Operational prototype**
  - Include controls to test interaction and navigation

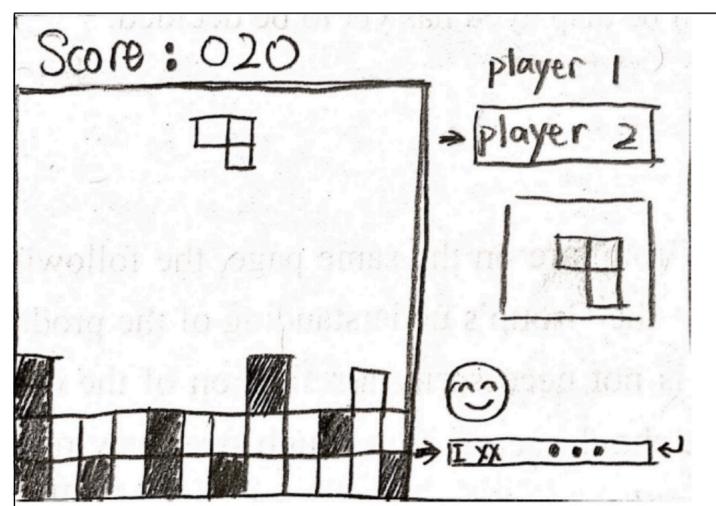


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## Paper Prototype

- Little effort has been spent on drawing the paper prototype
- People do not hesitate to propose **major changes**
- Changes can be made at **low cost**

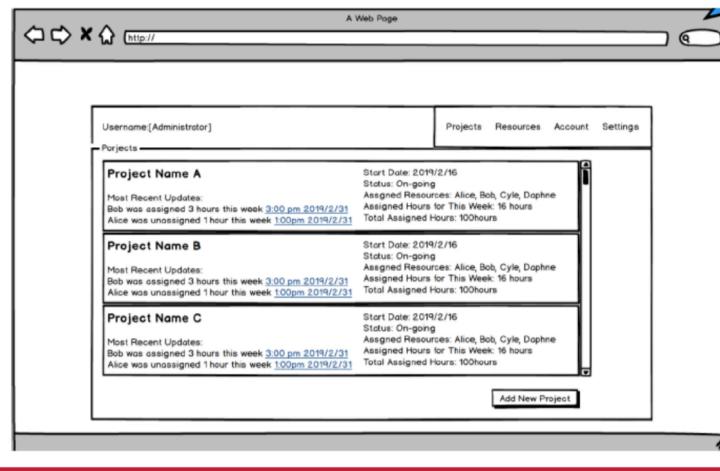


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## Wireframe

- A wireframe shows the layout of information and controls on a display
- This wireframe is created with Balsamiq



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## Mock-up

- A mock-up shows **suggested layout** and graphical design elements, such as icons, colors, fonts, etc.
- This mock-up was drawn with Photoshop

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## Mental Model and Computer Model

mental  
model

### Mental Model

The mental model is the user's view of the system and the user experience that it provides.

computer  
model

### Computer Model

The computer model is the functions, data, content, etc. provided by the system.



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## Mental Model and Computer Model (2)

- The **mental model** is the user's model of what the system provides
- The **computer model** may be quite different from the user's mental model

Example: A board game, e.g., chess

- Mental model: pieces on a board
- Computer model: data and logic that describe the game

Example: The desktop metaphor, e.g., Windows and Mac OS

- Mental model: files and folders on a desktop
- Computer model: file system and metadata about the items visible on screen



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## Mental Model vs. Computer Model

**The New York Times**

LATE EDITION  
BETWEEN PAGES: 40¢  
TODAY'S NEW YORK TIMES  
11/1/2018  
ISSUE NO. 20181101  
VOLUME CLXVI... No. 87432  
© 2018 The New York Times Company

NEW YORK, WEDNESDAY, NOVEMBER 14, 2018

**Cabinet Choice Wrote Remake Of Health Law**

**Plan Could Aid Doctors but Limit Consumers**

**MOVIE FINANCER IS SAID TO BE PICK FOR TREASURY JOB**

**Roots on Wall Street**

**Trump Elephants Loyalist Fights Campaign to Revive Past**

**JOY, THEN GRIEVE OVER BRAZIL TEAM**

**Despite Climate Vow, China Scratches for Coal**

**IN: INSIGHT: PEAK WASHINGTON — In choosing Merrick Garland to lead the Justice Department, he has health insurance coverage for his wife and children. But he has no plan to help the American Care Act become law. That's because he has no idea what was done to the law — or even if it was passed.**

**OUT: INSIGHT: BRITAIN — David Davis, secretary of state for exiting the European Union, has offered at least a glimpse into the fog.**

**Photo credit: AP Photo/Jacquelyn Martin**

**From left: David Davis, secretary of state for exiting the European Union; Foreign Secretary Boris Johnson; and Prime Minister Theresa May at a cabinet meeting in London this week. Pool photo by Peter Nicholls**

**INTERNATIONAL**

**Caught on Camera: Aide's 'Brexit' Notes**

By KATREN BENNHOLD

LONDON — It's official — or is it? The British strategy for its divorce from the European Union is to "have your cake and eat it," something critics have derided as delusional.

Ever since voting to leave the bloc, Britons have been trying to figure out whether their government has an actual plan for negotiating its exit, or "Brexit," and what that plan might be. This week, an open notepad, surreptitiously photographed in the grip of an aide leaving the aptly named Department for Exiting the European Union, has offered at least a glimpse into the fog.

The **mental model** is that the photograph is embedded in the text of the document...

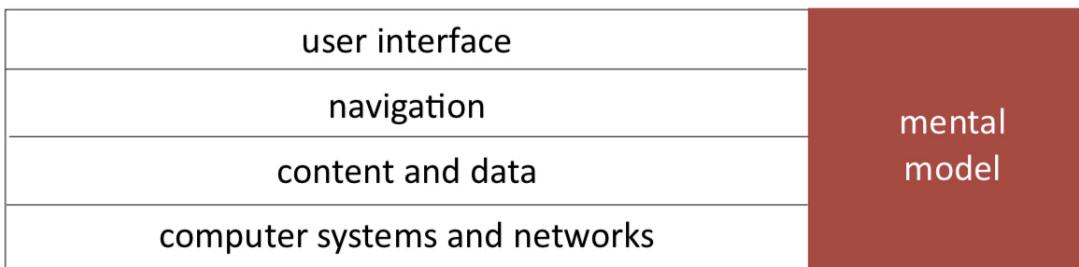
but in the **computer model** the text and photograph are independent files, which could be changed separately.

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## Mental Models and User Experience

The user experience is made up from several layers.



Collectively, these layers should provide a user experience that matches the mental model.

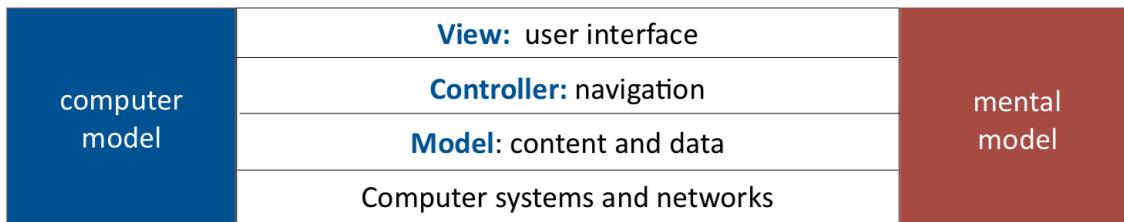
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## The Model View Control

The **Model View Controller (MVC)** is a computer model with layers that correspond to the layers of the mental model.

It is a very widely used model for interactive systems.



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## The Model View Controller

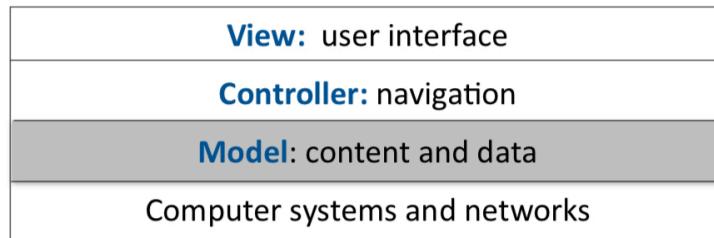
- The term **Model View Control (MVC)** is used with a wide variety of slightly different meanings
- In this lecture, we use MVC as a computer model for designing the user experience
- In other lectures, we may see it as:
  - a system architecture (system design)
  - a design pattern (program design)
  - a framework for program development



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## Model: Content and Data



In MVC, the **model** provides all the function of the program except for the interactions with the user. It includes:

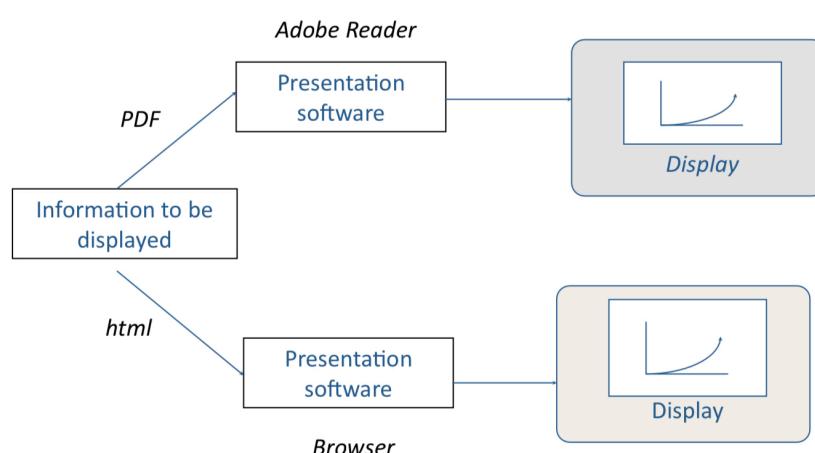
- program logic
- data structures, file systems
- content, e.g., text, graphical data, audio, metadata, etc.



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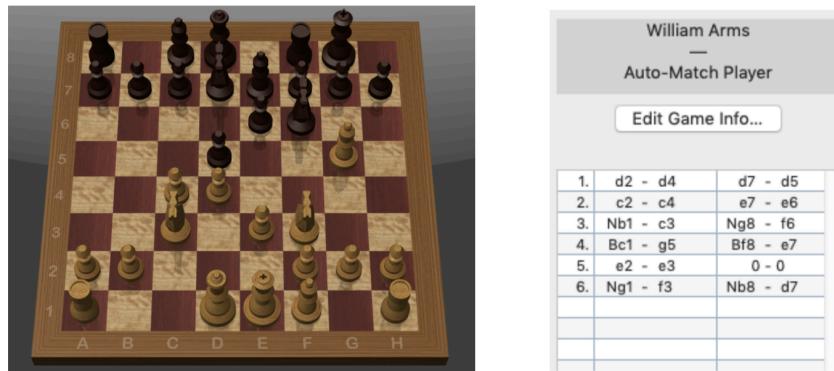
## Model: Separation of Content from the View



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## Model: Separation of Content from View



Two different ways to display a chess position, using the same model.

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## Navigation

The **controller** manages the flow of the application

- Controls the **navigation** through the various **displays** that a system provides (forms, panels, pages of a web site, etc.)
- Manages the **information** that is saved when leaving a display and makes it available to other displays
- Invokes user **interface functions** that convey information between the model and the user interface

*Different versions of MVC have different roles for the controller*



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## View: User Interface

The **user interface** is the appearance on the screen and the manipulation by the user

- **Graphical elements**, e.g., fonts, colors, logos, icons
- **Controls**, e.g., mouse, touch screen, keyboard
- **Input**, e.g., forms, text boxes, menus, buttons

**For user interface design, a team needs somebody who has skills in graphic design**



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## Principles of User Interface Design

User interface design is partly an art, but there are general principles

- **Consistency** – in appearance, controls, and function
- **Feedback** – what is the computer system doing? Why does the user see certain results?
- Users should be able to **interrupt** or **reverse actions**
- **Error handling** should be **simple** and **easy** to comprehend



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## Navigation: Menus

### Advantages

- Easy for users to learn and use
- Certain categories of error are avoided

### Major difficulty is structure of large number of choices

- Scrolling menus
- Hierarchical
- Associated control panels
- Menus plus command line



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## Simple is good

The Vendée Globe website features a prominent banner for the regatta, a navigation menu, and a news section with articles like "Indian Ocean contingent grows to nine".

The Economist website has a clean layout with a navigation bar, news articles, and a sidebar featuring a mobile device advertisement.



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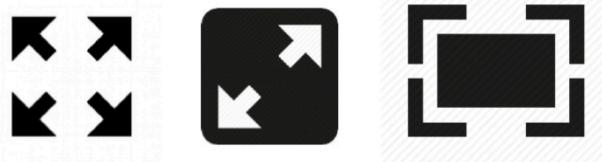
## Choices in User Interface Design

For the same **interface functions**, there may be a choice of **user interface designs**.

**Example: to leave full screen**

Keyboard: escape key, control-F

Icon + mouse/touch:



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## Design choices: Information Presentation

### • Text

- Precise, unambiguous
- Fast to compute and transmit

### • Graphics

- Simple to comprehend / learn
- Uses of color
- Variations show different cases



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## Simple is good: Command line interfaces

### Problems with graphical interfaces

- Not suitable for some complex interactions
- Only suitable for human users

**Command line interfaces: users interact with computer by typing commands (e.g., Linux shell script)**

- Allows complex instructions to be given to computer
- Can be adapted for people with disabilities
- Can be used for formal methods of specification and implementation
- Usually requires learning or training



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## 10. Models for Requirements

(end of lecture)

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