UI Design: A look at human behaviour and the impact on design

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Modern technologies provide software designers and developers with a vast array of platforms and tools. This session will consider the **psychology** and **studied behaviour** of humans to better understand how UI design impacts end-users and what designers can do to ensure usable, friendly design and implementation.
Overview

- The Role of Perception on Experience
- The Role of Proximity, Similarity, Continuity and Symmetry on Vision
- The Importance of Visual Structure
- The Role of Information Presentation on Reading
- Recognition vs Recall
- Time Requirements - Impact of System Responsiveness and real-time human interaction deadlines
- The Seven Stages of Action as Design Aids
- Bad Design - A Contributing Factor To Human Error
- Design Thinking
- Well Known Interface Design Rules
We Perceive What We Expect

• Our Perception is influenced by:
  • Past Experience
  • Present Context
  • Future Goals

• A well known example of our goals filtering our perceptions, is the “Cocktail Party” effect
  • If you are engaged in an interesting conversation at a crowded party your brain filters out surrounding chatter, however if you are bored by the conversation you will probably hear much more of the conversations around you.

• There are two mechanisms by which our goals bias our perception:
  • Perception is active, not passive – We constantly move our eyes, ears and hands so as to sample exactly the things in our environment that are most relevant to what we are doing and pretty much ignore anything unrelated to our goal.
  • Our Perceptual system becomes sensitized to certain features, For Example:
    - When scanning a parking lot searching for your car, vehicle models and colours similar to your car will be noticed, where other vehicles will barely register in our consciousness, even though we do in some sense, actually see them.

It has been noted that: When people navigate through software, seeking information or a specific function, they scan quickly and superficially for items that seems to be related to their goal. They don’t simply ignore items unrelated to their goals, but often don’t notice them in the first place.

Jeff Johnson
The Role of Perception on Experience – Design Implications

• Avoid Ambiguity
  • Avoid presenting users with ambiguous or unclear options

**Don’t**

![Delete all configuration files?](image1)

**Better**

![Are you sure all configuration files must be deleted?](image2)

**Even Better**

![You are about to permanently delete Userinfo configuration files. This Operation cannot be undone. Are you sure you want to delete configuration files?](image3)

• Try to achieve the following:
  • Use a clear question and definitive options in the dialog
  • Provide context
  • Design the dialog to yield closure
  • Provide appropriate feedback once the action is completed

• Where ambiguity is unavoidable, rely on standards or conventions to resolve it
The Role of Perception on Experience – Design Implications

• **Be Consistent**
  - When information or controls are duplicated in multiple screens, ensure that the layout, positioning and formatting is the same on all screens.
  - Recognition is better than recall
  - Ensure consistent use of images and terminology throughout the system

• **Understand the goals**
  - It is important to understand and accept that users’ goals may vary, and that their goals strongly influence what they perceive.
  - Very much like the complex data structures and algorithms that is researched and implemented to ensure efficient searching and planning routines, it is imperative to ensure that every element in the UI and action required in the process must assist the user as efficiently as possible to reach the desired goal state
Two different approaches for implementing search criteria filters

Find a Travel wallet for under R 500

Find a Fiber package with lines speeds between 20–100 mbps

• In the first design it is required to apply the search criteria 5 times to obtain the desired result set
• In the second, and much better design, it was only required to set the search criteria once to obtain the desired result set
The Role of Proximity, Similarity, Continuity and Symmetry on Vision

- Our vision is optimized to see structure, that is, our visual system automatically imposes structure on visual input and is wired to perceive whole shapes, figures and objects rather than disconnected edges, lines and areas.

- **Proximity**
  - The relative distance between objects in a display affects our perception of whether and how objects are organized into subgroups.
  - Objects that are near each other appear grouped, while those that are further apart do not.
  - Make sure the grouping is obvious.
  - Put enough whitespace around elements to make it clear what elements are actually grouped together.

Also consider formatting of text fields. Consider the following:

1. 1234567  
   1000000
2. 1,234,567  
   1,000,000
3. 1 234 567  
   1 000 000
### Examples of Questionable Proximity

<table>
<thead>
<tr>
<th>Title</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>First Name</td>
<td></td>
</tr>
<tr>
<td>Last Name</td>
<td></td>
</tr>
</tbody>
</table>

| Physical Address |   |

| Postal Address |   |

#### Advanced Features
- 4GL debugger enabled:
- Activate procedure:
- Deactivate procedure:
- Connect procedure:
- Disconnect procedure:
- Startup procedure:
- Shutdown procedure:
- Startup procedure parameters:
- Execution Time Limit: 0
Proximity Improvement

Advanced Features

40L debugger enabled:

Activate procedure:

Deactivate procedure:

Connect procedure:

Disconnect procedure:

Startup procedure:

Shutdown procedure:

Startup procedure parameters:

Execution Time Limit: 0
Responsive Design (Layout)

- When using responsive design frameworks be sure that the layout of the UI elements happens as expected – in the above example the principle of proximity is violated. The two hot-links (Speakers and Workshops) are separated by a “greater than desired” distance considering the proportional size of the UI.
The Role of Proximity, Similarity, Continuity and Symmetry on Vision

• Similarity
  • The human eye tends to build a relationship between similar elements in a design
  • Human vision is such that, when you mix objects with high degrees of similarity with a group of dissimilar objects, the brain devotes time and energy to creating a link between them, making the UI more demanding to interpret and therefore less usable
The Role of Proximity, Similarity, Continuity and Symmetry on Vision

• **Continuity**
  
  • The principle states that our visual perception is biased to perceive continuous forms rather than disconnected segments – even adding missing data if necessary

  ![Apple Computer logo](image1)
  ![Warner Bros. logo](image2)
  ![IBM Business Partner logo](image3)

  ![Slider control example](image4)

• The slider control is a good user-interface example of continuity
  
  • The slider control is interpreted as a range scale irrespective of the location of the slider
  • Using different colours for different ranges on the control does not disrupt our interpretation - if any, additional information is provided
The Role of Proximity, Similarity, Continuity and Symmetry on Vision

• Symmetry
  • Human vision is such that complex scenes is interpreted in such a way as to reduce complexity, the data in our visual field usually have more than one possible interpretation, but our vision automatically organizes and interprets the data so as to simplify and give it symmetry
  • On computer screens, our visual system’s reliance on the symmetry principle can be exploited to represent three dimensional objects on a two dimensional display

Summary:

Considering the previously mentioned principles (Proximity, Similarity, Continuity and symmetry), unintended visual relationships can be implied by a design. It is recommended to consider the principles when reviewing a newly created interface to insure that no unintended relationships is suggested in the design
The Importance of Visual Structure

- Perceiving structure in our environment helps us make sense of objects and events.
- As mentioned before, when people navigate through software or web sites, they don’t scrutinize screens carefully or read every word, they scan quickly for relevant information.
- The more structured the presentation of information, the faster it is for people to comprehend.

Consider the following examples:

<table>
<thead>
<tr>
<th>Flight</th>
<th>Departure</th>
<th>Arrival</th>
<th>Duration</th>
<th>Checked Baggage</th>
<th>Class</th>
<th>Seat</th>
<th>Ticket Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>00 08</td>
<td>Jimuiru</td>
<td>15</td>
<td>Nov 17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00 09</td>
<td>Jimuiru</td>
<td>15</td>
<td>Nov 17</td>
<td></td>
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<td>00 10</td>
<td>Jimuiru</td>
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<td>00 12</td>
<td>Jimuiru</td>
<td>15</td>
<td>Nov 17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Role of Information Presentation on Reading and Usability

- Skilled readers’ automatic context-free reading skills can be reduced to conscious, context-based reading (which is a burden on working memory) with careless writing or presentation
- This will have the effect of reducing speed and comprehension
- Even worse, in unskilled readers, poor design can block reading altogether
- Common mistakes include:
  - Uncommon or unfamiliar vocabulary
  - Poor selection of Typefaces and Fonts
  - Text on a noisy background
  - Information buried in repetition
  - Misuse of center aligned text
  - Presenting too much information
  - Inappropriate control usage and configuration
Recognition vs Recall

- Recognition is easy – Recall is Hard!
  - In recall you produce a fact, a word, or some other item from memory. In recognition you select or identify an item as one that you’ve learned previously – therefore recognition is based on past experience.
- The notion of Recognition vs Recall or Knowledge in the world vs Knowledge in the head, is the basis of the Graphical User Interface - See and choose is easier than recall and type.
- Short-term vs Long-term memory
  - Short-term memory considers situations in which information is stored for very short intervals, whereas long-term memory considers situations in which information is stored for long periods of time.
- Design implications
  - Always reduce the burden on short-term memory by providing sufficient (and relevant) feedback and visual cues as to the state of the system.
  - Avoid developing systems that burden long-term memory, for example imposing security questions from a menu for authentication purposes.
    - What if the user can’t answer any of the questions or cannot recall the answer to those questions.
    - Long-term memory is not an accurate high-definition recording of our experiences and is easily biased by other experiences.
Recognition vs Recall Example

For the command-line interface to SVN it was required to remember the following:

- The appropriate command to view the revision log
- The repository URL
- The correct switches to display a specific revision and output the changed files
- The revision number

For the GUI TortoiseSVN interface it was required to remember the following:

- I want to see the Log
- Revision Number
Don’t try this at home...
Impact of System Responsiveness and real-time human interaction deadlines

• Real-time interactive systems must meet certain deadlines in order to be perceived as “usable” by end-users.

• Researches have found that an interactive systems responsiveness, that is, its ability to keep up with users, keeping them informed about its status and not making them wait unexpectedly is the most important factor in determining user satisfaction.

• Important to note here is the difference between performance and responsiveness.
  • Performance is measured in terms of computations per unit of time: Query performance, database tuning, algorithm efficiency etc.
  • Responsiveness is measured in terms of compliance with human time requirements, time constraints and satisfaction.

• Responsive systems keeps the user informed by:
  • Informing the user that the input has been received.
  • Provide some indication of expected duration.
  • Free the end-user to do other things.
Good Example of a really bad webpage

- Initial look and feel of the page is pretty good
  - Proximity, visual structure and symmetry is good
- However:
  - It is a really static interface, no responsive elements in the UI, as soon as the size of the browser is less than the width of the page, scrollbars appear and the page becomes almost unusable
  - There is a lot of work that must be done by the end-user – no “dynamic” paging is done, and the only link to the next page is displayed before any results
  - There is absolutely no feedback to the end-user to indicated that the request has been successfully submitted
  - The site is extremely sluggish – needless to say, it was faster to drive to the store and do the upgrade the old-fashioned way
Guidelines for achieving responsive systems

• Indicate when the system is busy
  • Progress Bars, wait-cursors
  • Software should display a busy indicator for any function that blocks user interaction while it is executing

• Use progress indicators
  • Progress Bars, Count of some sorts
  • Progress indicators greatly increase the perceived responsiveness of a system
  • The longer the operation the more detailed and accurate the indicator should be

• Provide timely feedback
  • When the amount of data is too large or time-consuming to display all at once, use paging or give an overview of all the data and allow the user to drill down into specific detail
Examples to Manage Responsiveness

Questionable Responsiveness

Good Responsiveness
The Seven Stages of Action as Design Aids

- According to Norman (The design of everyday things) the seven-stage model of the action cycle can be a valuable design tool as it provides a basic checklist of questions to ask
  1. What do I want to accomplish
  2. What are the alternative action sequences
  3. What action can I do now
  4. How do I do it
  5. What happened
  6. What does it mean
  7. Have I accomplished my goal

- The insights from the seven stages leads to seven design principles
  1. **Discoverability** – Ensure that it is possible to determine the possible actions and the current state
  2. **Feedback** – There is continuous feedback about the results of actions and the state of the system
  3. **Conceptual model** – The design projects all the information needed to create a good conceptual model of the system, leading to understanding and feeling in control of the system
  4. **Affordances** – The proper affordances exist to make the desired actions possible
  5. **Signifiers** – Effective use of signifiers ensures discoverability
  6. **Mappings** – The relationship between controls and their actions follows the principles of good mapping, enhanced as much as possible by spatial layout
  7. **Constraints** – Providing physical, logical and semantic constraints that guide actions and eases interpretation
Bad Design - A Contributing Factor To Human Error

• Why do we need to know about the human mind?
  • Things are designed to be used by people and without a deep understanding of people, the designs are apt to be faulty, difficult to use and difficult to understand
  • People naturally look for causes of an event to form explanations and stories – stories resonate with our experiences and provide baseline examples for new events
  • People tend to assign a causal relation whenever two things occur in succession, even if there was no relationship between the two
  • If a person expects a result and nothing happens, the lack of informative feedback is interpreted in such a way as to conclude that the action was performed incorrectly – therefore the most likely thing to do, is to repeat the action (probably with more force)
• The physical limitation of humans are well understood by designers, however the mental limitations are greatly misunderstood
• Understanding why there is an error
  • Errors occurs for many reasons – interruptions are a common reason for error, not helped by design and procedures that assumes full dedicated attention, yet does not provide an easy way to resume operations after an interruption
  • Many systems makes is easy to make mistakes but difficult or impossible to discover the error or to recover from it
Bad Design - A Contributing Factor To Human Error

• Designing for Error
  • It is fairly simple to design for the situation where everything goes well, where people use the device in a way that was intended and no unforeseen events occur
  • Consider the following human behavior:
    • If a person says something that is not understandable we ask for clarification
    • If a person says something we believe to be false, we question and debate
    • We don’t issue warning signals, beep or give error messages

• This behavior can be introduced into our designs by doing the following:
  • Understanding the causes of the error and design to minimize those causes
  • Do sensibility checks
  • Make it possible to reverse actions or make it difficult to do what cannot be reversed
  • Don’t treat the action as an error, rather try to help the user complete the action properly
Bad Design - A Contributing Factor To Human Error

• **Design Implications**
  - Add constraints to block errors
    - Prevention often involves adding specific constraints to actions – for example using radio- or state buttons instead of check-boxes to ensure a single selection of conflicting selections
  - **Undo**
    - Perhaps the most powerful tool to minimize the impact of error is the undo command. Better design allows for multiple levels of undoing so that it is possible to undo an entire sequence of events
    - Obviously it is not always possible to undo actions without causing other implications
  - **Confirmation and Error Messages**
    - Many systems try to prevent errors by requiring confirmation before execution - can lead to a loss of data or cannot be undone
    - It is important to make visible the action and the implications of the action
    - To minimize the effects of mistakes the following can be done:
      - Make the item being acted upon more prominent
      - Make the operation reversible
      - Require confirmation utilizing a different input method or paradigm
Bad Design - A Contributing Factor To Human Error

• Design principles for dealing with error
  • Difficulties arise when we don not think of people and machines as collaborative systems, but assign whatever tasks can be automate to the machines and the rest to people
  • What we call “Human Error” is often simply a human action that is inappropriate for the needs of technology – It should not be thought of as error – instead we should realize that sometimes people need assistance in translating their goals and plans into appropriate form for technology
  • Given the mismatch between human competency and technological requirements, errors are inevitable
  • Better designs accepts this as a fact and seek to minimize opportunities for errors while also mitigating the consequences
• As designers how do we do this:
  • Put the knowledge required to operate the technology in the world (Recognition). Basic and advanced modes of user interfaces work really well to accommodate experts and novice users alike
  • Use the power of natural and physical constraints

We should deal with errors by embracing them, seeking to understand the causes and ensuring that they do not happen again.
Design Thinking

• Solving the Correct Problem
  • As engineers and business people we are trained to solve problems - Be sure to solve the fundamental root problem and not one of the symptoms of the problem
  • A Key goal for designers is to develop products that fit the needs and capabilities of people
  • Effective design must satisfy a large number of constraints and concerns:
    • Cost and Efficiency
    • Reliability and Effectiveness
    • Understandability and Usability

• Norman Suggests the Iterative Cycle of Human-Centered Design
  • Make Observations on the intended target population
  • Generate Ideas
    • Produce Prototypes and test them
    • Repeat until satisfied

• Design Research vs Market Research
  • The two fields are complementary, but each with a different focus
  • Design wants to know what people really need and how they will actually use it whereas Marketing wants to know what people will buy and how they make their purchasing decisions
Design Thinking

• Idea Generation
  • This is the process of generating potential solutions to the “Root Problem” or design requirements that has been determined
  • Three good rules to live by:
    • Generate Multiple ideas or solutions
    • Follow a green-fields approach to the design – avoid premature dismissal of ideas
    • Question everything

• Prototyping, Testing and Iteration
  • The only way to know whether a solution is reasonable is to test it – a quick prototype or mockup can be created for this purpose
  • Ideally try to test with a group of people that is representative to the intended user base
  • Iteration provides for continuous refinement and improvements – the goal is rapid prototyping and testing
  • The iteration phase is also a valuable place to determine whether the correct problem has been addressed

• Two curveballs to theoretical design thinking and application
  • Very often some of the required features will be derived from the need to match the competition
  • Some features will be derived from the availability of new technology
Well Known Interface Design Rules

- Focus on Users and their tasks, not on technology
- Consider function first and presentation later
- Conform to the users’ view of the task
- Design for the common case
- Don’t complicate the users’ task
- Facilitate learning
- Deliver information and not just data
- Design for responsiveness
- Focus on consistency and Standards
- Ensure Visibility of System Status
- Offer Informative Feedback
- Test the design on “real” users
Upcoming event

EMEA PUG Challenge 2017
16 November-17 November
Clarion Congress Hotel Prague

Overview

MANAGE YOUR TRIP

Check-in
You can check in 48 hours before your flight

Upgrade flights
Enjoy a cabin class upgrade

Choose seats
Incomplete

Itinerary

9 Nov 2017
Johannesburg to Dubai

EK764

JNB 18:50
8h 15m
05:05
Terminal A

DXB

Terminal 3

Passengers

Emirates

LinkedIn

Some of our Progress employees collected bottled water for those affected by Hurricane Harvey. They collected over 88 cases of water. Our thoughts are with those affected.

Like

Mike Fechner likes this

Progress
20 000 followers
8d
12 connections work here

Tracy Kleynhans
SAP Resource Acquisition Consultant at Britehouse

1 day

Home
My Network
Messaging
Notifications
Jobs

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Bibliography


• Don Norman (2013). The Design of Everyday Things. Basic Books
Illuminating what’s next™