

Comp 341/441 - Human-Computer Interface Design

Spring Semester 2017 - Week 4

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Users & Mental Models

navigation map

- many applications include the notion of places
 - *pages, screens, tabs, windows...*
- a **navigation map** will be formed by a user
 - *allows a user to differentiate between these places*
 - *return quickly to common places*
- navigation becomes a regular action for users in applications
- maps often applied to comparative applications
 - *expectation of similar usage and interaction*
- multiple options for same location
 - *users may not always be aware of competing routes*
 - *preferred routes often take precedence*

Image - Navigation Map

simple website example

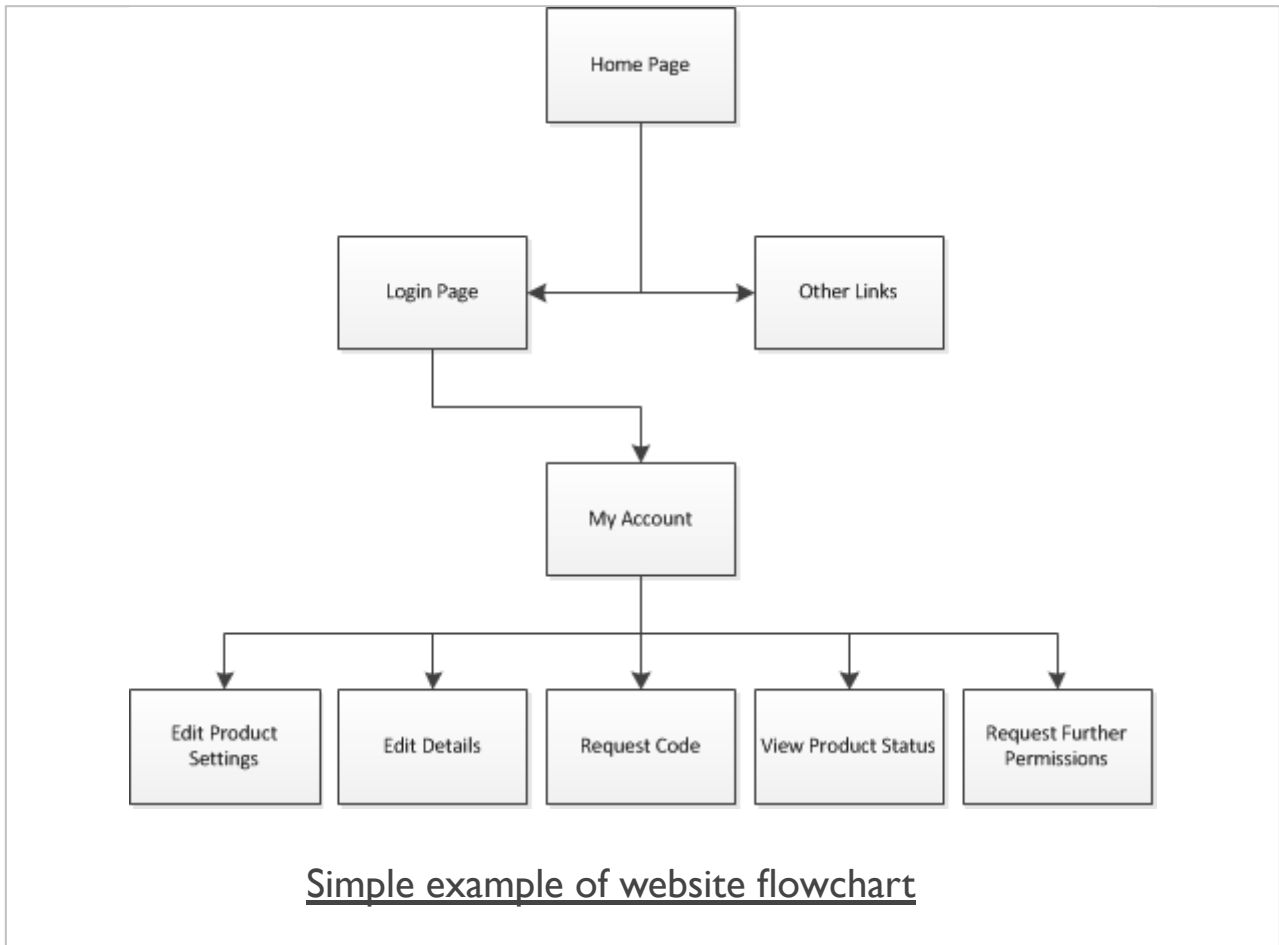
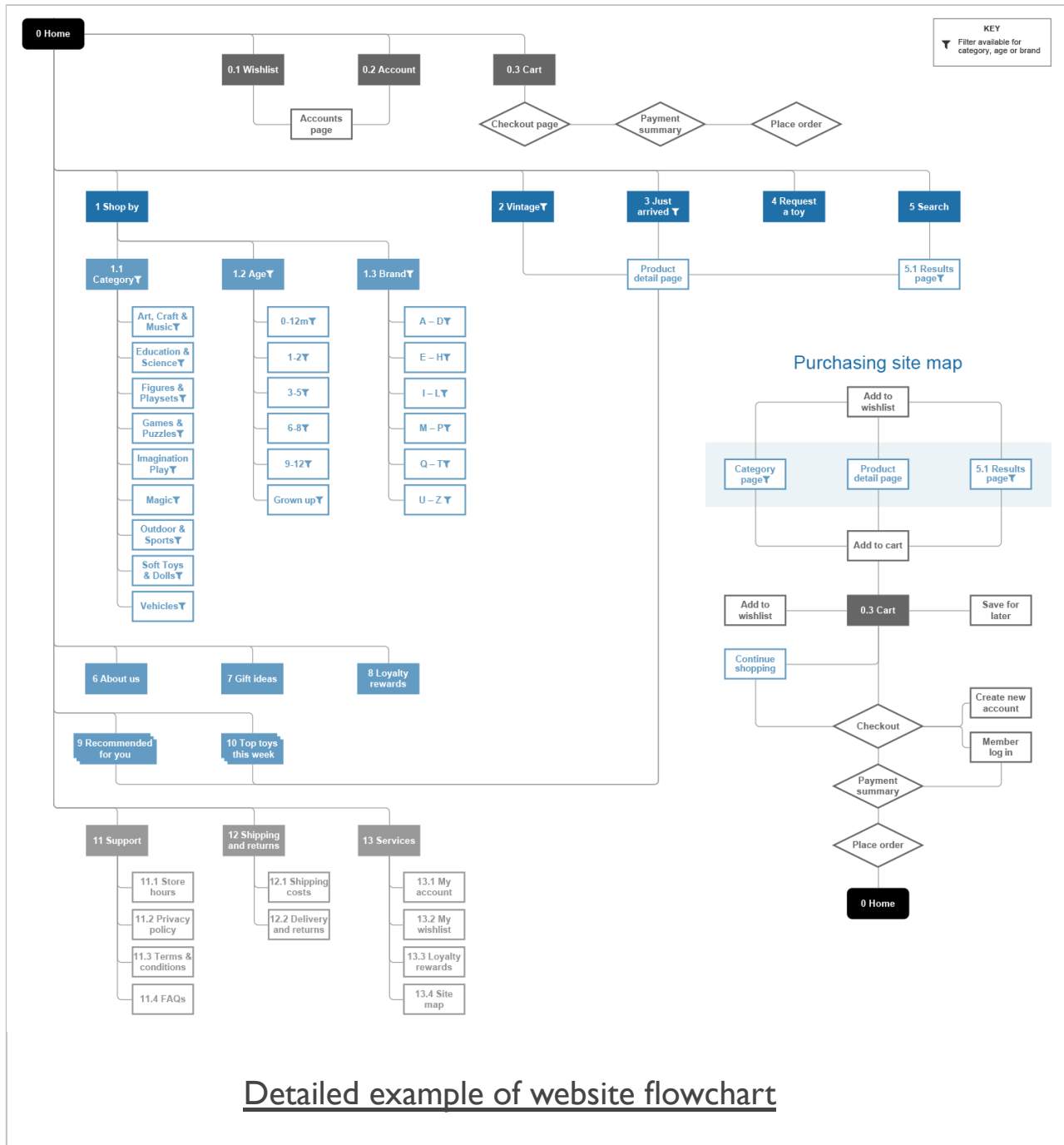


Image - Navigation Map

detailed website example



Users & Mental Models

plans & strategies for accomplishing tasks & reacting to problems...

- users often memorise **plans of action** for given tasks
- an **action plan** might reflect a simple sequence of required user steps
- a more experienced user may internalise a required conceptual structure
 - *this mental depiction may not be complete or accurate*
- user may not be aware of why a sequence works or not
 - *simply memorised the sequence*
- taught users may know how but not why
- success by trial and error

Users & Mental Models

heuristics, conventions...

- general heuristics may be included in a user's mental model
 - *rule of thumb style guidelines*
 - *other conventions acquired from a broader context*
- learned and added from experience
- subsequently applied to a given system
- common UI elements between disparate applications
 - *application and operating system*
 - *allows a user to infer interaction patterns for an application*

Video - Mobile Gaming

Meet Super Mario Run

Meet Super Mario Run



Source - YouTube

Users & Mental Models

perception of application's implementation model

- users infer patterns for behaviour within an application
- an application's code and implementation will often remain hidden to a user
- does not prevent a user from recognising usage patterns
 - *not always a bad thing for an application*
 - *such patterns can be beneficial for a designer*
- content output and rendering a good example of pattern forming
 - *user adds content to table*
 - *notices data added to top*
 - *infers table output pattern*

Users & Mental Models

communicating a mental model

- mental models are also part of the initial design process
- designers naturally form a conceptual mental model for our own application
- our goal is to ensure a user's mental model matches our own
- we can provide structured learning and education
 - *documentation, training, demos...*
- many users may not read the documentation or follow tutorials
- many users still rely on trial and error

Users & Mental Models

communicating a mental model...cont'd

- visual presentation of UI provides cues and guidance to users
 - *how to complete actions and tasks*
- application behaviour provides feedback to the user
 - *whether those actions and tasks have been successful or not*
- hoped that as a user develops familiarity with an application's UI
 - *their mental model will more closely approximate the designers*
- Don Norman refers to the **design model** and **user's model**
 - *refers to product's interface as **system image***
- design model and system image need to align

Users & Mental Models

a few questions

Q: Choose one of your products, again good or bad, and think of the **user model** that you have developed for this interface?

Q: What influenced the development of that **user model**? For example, was it good or bad design, interaction options, previous experience with similar product interfaces, and so on.

Q: Did further training or experience modify that **user model**? How and why?

Human memory

intro

- context in user interaction is important
 - *helps establish an application in a user's short-term memory*
- predominant models for human memory include
 - *short-term or working memory*
 - *long-term memory*
- inter-related structural nature of working and long-term memory

Human memory

short-term, working memory

- conceptually similar to a temporary memory store
- able to hold a limited amount of data
 - *might include words, numbers, symbols...*
 - *related to current user task*
- working memory decays quickly & often lost
 - *we lose focus, switch to another task...*
- rehearsal and repetition of a given task is useful prevention
 - *helps us maintain useful or important information*
- capacity of working memory
 - *"seven, plus or minus two"*
 - *Miller, G. A. "The magical number seven, plus or minus two: Some limits on our capacity for processing information." 1956.*
- 7 numbers for North American local dialling
- harder for most people to hold more than about 7 digits...

Human memory

changing limited capacity in working memory

- free up working memory to replay and rehearse new information
- compare with computer memory, and related performance without free memory
- learning is naturally reduced and slows down
- a good example of this is mental arithmetic
- difficult to hold even limited amounts of information and process effectively
- burden on working memory is known as 'cognitive load'
- reduction of cognitive load fosters learning by freeing working memory

Video - Human memory

working memory - why the brain can't multitask

Why the Human Brain Can't Multitask



Source - YouTube

Human memory

long-term memory

- more permanent, persistent store
- allows us to save and recall knowledge, memories at a later date
- store any facts, both good and bad
- also stores procedures and skills
 - *both cognitive and sensory-motor tasks related*
- also permanent memory store
 - *some data will naturally degrade or deteriorate over time*
- may experience some sense of false recall
 - *memory items become confused or combined irregularly*

Human memory

the very act of memorisation

- the act of intentionally committing something from short-term to long-term memory
- normally achieved through repetition
 - *more frequent we encounter something, more likely we are to remember*
- eg: studying involves actively & intentionally re-reading, rehearsing & practicing
- also need to be able to store other long-term data
 - *important, novel, surprising, and unusual information without repetition*
- exact nature of how this works still remains largely unknown
- such memories are believed to be stored symbolically
- we may not retain exact copy of event or material
 - *instead we create symbolic hooks to allow easier recall of data*

Human memory

memory storage and recall

- tend to store information in logical groupings
- psychologists refer to this as **chunks**
- memory most effective when **chunks** are related
 - *these are logical connections or relationships*
- eg: association between a person and related information
 - *their face and name*
 - *their job title and name*
 - *family or colleague associations...*

Human memory

memory recognition and recall

- recall of information, events etc normally triggered by a prompt or cue
 - *eg: recognising someone in a crowd may trigger recall of their name...*
- more recent information tends to lead to better recall
 - *known as **recency effect***
- often easier to recall related information as well
- poor, fractured recall shows imperfect nature of long-term memory
- often recall hazy or false data from long-term memory

Image - Human memory

a test of memory and recall



a test of memory and recall...

Human memory

retrieval and transfer of new knowledge and skills

- not sufficient to simply add new knowledge to long-term memory
 - *new knowledge needs to be easily retrieved in context*
- retrieval of new skills essential for successful transfer of knowledge and experience
- knowledge successfully stored in long-term memory
 - *no use unless we may successfully recall later, as required*
- interface design necessarily needs to incorporate context to help retrieval
 - *examples and practice exercises*

Human memory

retrieval and mnemonics

- interface design necessarily needs to incorporate context to help retrieval
 - *examples and practice exercises*
 - *simple mnemonics as a child*
- mnemonics to help with easier recall
 - e.g. **N.E.C.E.S.S.A.R.Y, SOHCAHTOA**
- might ask users to apply their new knowledge relevant to actual scenarios
 - *job learning and training scenarios, role play, troubleshooting exercises...*
- often see this example within games or education applications
 - *a skill is demonstrated and then the user is asked to practice*
 - *before moving on to the main application or game*
- link or hook new knowledge to long-term memory

References

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