Enhancing User Experience By Employing Collective Intelligence

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Meet the Presenter

• Education
  – M.S. Computer Science and Application, Virginia Tech
  – Thesis: Activity-based Knowledge Management Tool Design for Educators

• Work Experience
  – Companies large and small
  – Currently User Experience consultant
Presentation Overview

• Background

• Examples of Collective Intelligence

• Implementing Collective Intelligence

• Applications in Current L3D Research
What is Collective Intelligence?

• **Collective intelligence** is a form of intelligence that emerges from the collaboration and competition of many individuals. (Wikipedia)

• Necessary Ingredients from Participants:
  – Appropriate mind-set
  – Willingness to share
  – Openness to the value of distributed intelligence for the common good
Why Do We Care About Collective Intelligence on the Web?

• Signal vs. Noise in the Long Tail
Why Do We Care About Collective Intelligence Now?
What Is User Experience?

- useful
- usable
- valuable
- findable
- accessible
- credible
Why Do We Care About UX?

![Microsoft Access dialog box with an error message]

![Microsoft Excel dialog box with a save confirmation message]
Why Do We Care About UX?
Why Is UX Important to Collective Intelligence (and vice versa)?

- Utility = Value / Effort

- “Reservoir of Goodwill” (Krug)
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Explicit vs. Implicit Activities

• Implicit
  – Insight achieved inherently with no extra work from the user

• Explicit
  – Insight requires specific activity from user
Common Computer-based Collective Intelligence Applications

• Social Networks
• Discussion Forums
• Mailing Lists
• Rating Systems
• Tags
Google

- Google Search
  - A giant recommendation system
  - Condor (Gloor)

- Google Trends
  - Asks: “What are people searching for?”
  - Takes Google Search a step further
Amazon

• System Activity
  – Home page recommendations
  – “People who bought this also purchased…”
  – “Buy this with this and get an additional 5% off”

• User Activity
  – Item Viewing
  – Purchasing
  – “I Own It” Control (Yes/No)
  – Rating System (1-5 Scale)
  – Was this review helpful? (Yes/No)
  – Tags
Netflix

- Recommendations and the Netflix Prize
  - $1,000,000 to entrant scoring 10% better than Netflix’s Cinematch recommendation system
  - Began as a crowdsourcing endeavor but became a source of collective intelligence
    - 12/2006 – Third place entrant posted complete algorithm online
    - Netflix has incorporated ideas from current leader into Cinematch
    - Just a Guy in a Garage
Enhancing User Experience by Employing Collective Intelligence

All time most popular tags

- africa
- amsterdam
- animals
- architecture
- art
- asia
- australia
- autumn
- baby
- band
- barcelo
- beach
- berlin
- birthday
- black
- blackandwhite
- blue
- boston
- bw
- california
- cameraphone
- camping
- canada
- canon
- car
- cat
- chicago
- china
- christmas
- church
- city
- clouds
- color
- concert
- cute
- day
- de
- dog
- england
- europe
- fall
- family
- festival
- film
- florida
- flower
- flowers
- food
- france
- friends
- fun
- garden
- geotagged
- germany
- girl
- graffiti
- green
- halloween
- hawaii
- hiking
- holiday
- home
- honeymoon
- house
- india
- ireland
- island
- italy
- japan
- july
- kids
- la
- lake
- landscape
- light
- live
- london
- macro
- march
- me
- mexico
- mountain
- mountains
- museum
- music
- nature
- new
- newyork
- newyorkcity
- newzealand
- night
- nikon
- nyc
- ocean
- paris
- park
- party
- people
- photo
- photos
- portrait
- red
- river
- rock
- rome
- san
- sanfrancisco
- scotland
- sea
- seattle
- show
- sky
- snow
- span
- spring
- street
- summer
- sun
- sunset
- sydney
- taiwan
- texas
- thailand
- tokyo
- toronto
- tour
- travel
- tree
- trees
- trip
- uk
- urban
- usa
- vacation
- vancouver
- washington
- water
- wedding
- white
- winter
- yellow
- york
- zoo
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<th>Over the last week</th>
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<td>notovideos, rsgmeetup20080412,</td>
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<td>silvio, crafting365, project3662008,</td>
<td>novideoxonflickr, notovideo,</td>
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</table>
Other Examples

- Open Source Software
- **del.icio.us** – Social bookmarking via tagging
- **Wikipedia** – When crowdsourcing becomes collective intelligence
- **Digg Visualizations** – Was UX ignored?
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User Experience Tasks

- Requirements Gathering
- Task Flows/Wireframing/Prototyping
- Testing
- Evaluation
Programming Collective Intelligence

• Using Tags
  – Identification
  – Searching
  – Tag Clouds

• Not Using Tags
  – UX Consideration
Programming Collective Intelligence

• Making Recommendations
  – Similarity Coefficients
    • Euclidean Distance
    • Pearson Correlation
    • Tanimoto Similarity Score
    • Others (Jaccard, Manhattan, et cetera)
  – Cognitive Biases
Euclidean Distance

- Used in ratings systems
- Straight-line distance between two points
  \[ \sqrt{(p_1 - q_1)^2 + (p_2 - q_2)^2} \]
- Can be used to measure difference in ratings by two people
- To get a similarity score between two people, calculate
  \[ \frac{1}{1 + \sqrt{\sum_{i=1}^{n} (p_i - q_i)^2}} \]
  which yields a number between 0 and 1, where 1 means that the two people rated all of the items identically
Pearson Similarity Coefficient

- Measure of how well two sets of data fit on a straight line

\[
\frac{\sum XY - \frac{\sum X \sum Y}{N}}{\sqrt{\left(\sum X^2 - \frac{(\sum X)^2}{N}\right)\left(\sum Y^2 - \frac{(\sum Y)^2}{N}\right)}}
\]

- Correlation of 1 means ratings were identical
Tanimoto Similarity Score

\[ 1 - \frac{N_C}{N_A + N_B - N_C} \]

• Where
  – \( N_A \): Total items in A
  – \( N_B \): Total items in B
  – \( N_C \): Total items in both A and B

• Tanimoto Similarity Score is the ratio of the intersection set to the union set
Cognitive Biases

• Psychological Effects That Can Skew Data
  – Example: Anchoring in Netflix ratings
Clustering

• Prepare data using common set of numerical attributes used to compare items

• Choose clustering method
  – Hierarchical Clustering
  – K-Means Clustering
Hierarchical Clustering
K-Means Clustering
Clustering Blogs with Hierarchical Clustering
Visualizing Clusters - Dendograms
Clustering Blogs with Hierarchical Clustering
Clustering Words within Blogs with Hierarchical Clustering
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Applications to Meta-Design

• Meta-Design Explores Personally Meaningful Activities
  – Output of collective intelligence applications must be relevant to participants

• Meta-Design Requires Active Contributors
  – Collective intelligence applications allow for a wide range of activity, from implicit to very explicit contributions

• Meta-Design Raises Research Problems, Including Collaboration and Motivation
  – Collective intelligence applications can enable implicit collaboration
  – Collective intelligence applications can yield results otherwise not seen by participants, thus increasing utility and positively influencing motivation
Applications in ‘Transformative Models of Learning…’

• Why attempt to improve UX through Collective Intelligence in this research?
  – As the size of a VO scales upwards, the ability to easily identify connections among members and find relevant information decreases
  – Aiming to Create a VO of Active Contributors
  – Utility = Value / Effort
Applications in ‘Transformative Models of Learning…’

• Link Members of VO
  – Activity: Members of VO tag themselves
  • Tags – Skills they have, skills they lack (but have use for), research interests
  • Use Tanimoto score to match members with similar research interests
  • Use Tanimoto score to match members who lack a skill with members who have that skill
Applications in ‘Transformative Models of Learning…’

- Discover Relevant Areas of Study
  - Activity: Rate coursework taken
    - System stores previous coursework of all participants
    - Students can rate this coursework according to how much they liked the subject
    - System uses ratings to suggest other areas of study which may be interesting to student
Applications in ‘Transformative Models of Learning…’

• Explore Relevant Content
  – Activity: Cluster content within VO
    • Allow members of VO to explore relevant content in clusters using visualizations such as dendograms
Applications in “…Using and Evolving Software Products”

• Increase Utility of SAP Message Boards
  – Cluster related messages and allow users to explore the messages via an interactive dendogram
  – Make recommendations of threads users may be interested in reading
Suggested Readings

- Blog of Collective Intelligence (Pór)
- Programming Collective Intelligence (Segaran)
- Peter Morville on User Experience Design
- Elements of User Experience (Garrett)
- The Machine is Us/ing Us