Motivating User Participation in Social Learning Applications

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Outline

- WHY?

- WHAT ➔ HOW ➔ SHOW

Theories ➔ Design Approaches ➔ Examples
- Economics ➔ Markets ➔ I-Help
- Behavioural Economics ➔ Gamification ➔ Comtella
- Psychology ➔ Interventions ➔ Visualizations

- WHAT’S NEXT?
Why?

Abandoned online communities

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Theories of Motivation: Economics

• People are utility maximizers
• → Create a system of appropriate rewards
  – Rules of encounter and rules defining rewards
  – Rules apply to everyone (no personalization)
  – Goal: optimize the overall system performance by some criteria
I-Help Economy

Incentive: earning currency by helping others
Price regulates the demand and supply of help

However, the knowledge generated in each help transaction is an externality
The goal of the system should be to max the knowledge generated, not the money...

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Challenges

• How much should users know about the mechanism?
  – They should focus on learning, not on making money
  – How to prevent gaming?

• Design of the user interface:
  – What metaphor?
  – How much control over the bargaining?
  – How much knowledge of the rules?

• How to adapt the mechanism at run time?
  – Need to respond to unpredicted patterns of undesirable behaviour: at micro level (policing) or at macro level (by dynamically changing the rules)
Other systems based on markets

• Micro-payments in P2P systems
  – Invisible to users, paid automatically for better download speed
• Google Answers (Rafaeli et al., 2008) – a market like eBay (real $$$), but for help
  – Closed down in 2006 due to massive abuse
• Yahoo Answers – no currency, but... Reputation!
## Theories of motivation: psychology

- There are many...

### General theories:

- Self-determination theory (competence, autonomy, relatedness) (Deci & Ryan)
- Theory of Planned behavior (Ajzen)

### Needs-based theories:

- Maslow’s hierarchy
- Alderfer’s ERG theory
- Acquired needs theory
- Self-efficacy (Bandura)
- Goal setting theory (Latham & Locke)

### Social, Intrinsic, Extrinsic:

- Cognitive Dissonance (Festinger)
- Social Comparison (Festinger)
- Two-factor theory (Herzberg)
- Equity theory (Adams)

### Rewards-based:

- Reinforcement (Skinner)
- Expectancy theory (Vroom)

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Social comparison

• Social Comparison theory (Festinger, 1954)
  people tend to compare themselves with others, who they perceive as similar to them, in order to evaluate or enhance some aspects of the self
  – Assimilation – serves self-enhancement if comparing to a superior peer (role model)
  – Contrast – protects subjective well-being (also self-enhancement) if comparing with an inferior peer

• Competitive people engage actively in social comparison, if they find themselves in a perceived “game-frame”

• It works!! Generally – doubles participation!
Reputation “economies”

• Theoretical basis:
  – Kollock P., 1999, The Economics of Online Cooperation

• Difference between Status and Reputation
  – Status can be earned by oneself (e.g. skill levels)
  – Reputation is earned by recognition from others

• Examples
  – Facebook – number of friends
  – Amazon – reviewer’s reputation by ratings of others
Motivating user participation with status

Case study: Comtella, 2004

- **Status** (based on points earned with activities) can be earned by contributing more papers.

- **Ownership**: a virtual card, brings privileges
  - Can be lost if the user stops contributing (*Theory of Fear, Theory of Discrete Emotions, Cialdini, 2000*)

- User have to be aware of her achievement: **leader-board** (social vis)
  - *Allows social comparison*
Evaluation: effect of status on participation

- Sharing articles in a 4th year *Ethics and IT* class, 2004
- Increase in participation, but temporary
- Gaming

### Community Needs:

- Specific time-pattern of contributions is preferred;
- Need to contribute early, but discourage over-contributions!
- When there is sufficient contributions, rating articles becomes more important than contributing new articles
Introducing reputation in Comtella, 2005

- **Status** (#contrib.) – gold, silver, bronze, plastic
- **Reputation** (avg. rating of contrib.) - brightness
- **Dynamic and personalized** rewards

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### Comtella Model

**Community Model**
- Expected # of Total Contributions: \(Q_c\)
- Community Reward Factor: \(F_c\)

**Individual Model**
- Average Quality of Contributions: \(C_i\)
- Individual Reward Factor: \(F_i\)
- Expected # of Contributions: \(Q_i\)
- Average Quality of Rating: \(R_i\)

**User Actions**
- Share papers
- Rate papers

**Community Features**
- Personalized messages
- Different user interface
- More ratings to give out
- Glory in the community

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Evaluation

• Controlled study in Ethics class, 2005, 21 students
• Mechanism was very effective in stimulating exactly the desired behaviour
• Number of ratings by experimental group twice higher than control group
• No over-contributions for both groups, #submissions close to the desired number for each week
• Experimental group brought higher-quality papers than the control group
• Experimental group brought contributions earlier in the week than the control group
Gamification

• **User experience design approach**
  - **Definition:** The integration of Game Mechanics in non-game environments, to increase audience engagement, loyalty and fun ([www.gamification.org](http://www.gamification.org))
  - “By 2014, a gamified service for consumer goods marketing and customer retention will become as important as Facebook, eBay or Amazon, and more than 70 percent of Global 2000 organizations will have at least one gamified application.” (Gartner Newsroom, April 12, 2011: [http://www.gartner.com/it/page.jsp?id=1629214](http://www.gartner.com/it/page.jsp?id=1629214))

• **Introducing:**
  - Challenges (goals, constraints, clear rules),
  - Feedback (rewards),
  - Competition (leaderboards)

• **Fostering** user’s:
  - Ownership
  - Achievement
  - Status / reputation
  - Collaboration (quests)
Businesses are jumping in
Also online learning sites
Has your child or a child you know done something commendable?

Use our badges to encourage and motivate your children!

Get Started Now! with a free account

"We have young children and within two days of using this service we have found how excited our 6 year old is about doing good deeds and receiving badges." - Heather

Kids Earn and Collect Online Badges!

With every accomplishment, good-deed, skill-earned, or milestone, you can award your child a unique online badge, choosing from a collection of 110 custom badges.

Their collection will grow as you reward and commend them for their efforts and hard work!

Your Child's Badges

Most Popular Badges

Academics Award: 2011-08-11
6 comments

The Academics badge.
Award This Badge

Cookie Class for pets

Sign in | Create Your Account
Not all students played the reputation game in Comtella!

Andrew Webster

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Critical view of gamification

- Ultimately, the game will not be interesting anymore
- Ubiquitous points gathering will turn away the most creative and valuable users
- In educational context, it will teach children to care about outward signs of achievement, praise, and other people’s opinions, rather than personal growth and learning
Provide conditions for intrinsic motivation

• Provide “Deeper, internal rewards”
  – Achieving mastery
  – Overcoming challenges
  – Connecting with others
  – Working for some bigger, meaningful cause

Learning (Detterding, 2011)
Gamification supports learning
  - Challenges (clear goals) allow us to make achievements
  - Feedback systems make it easier for us to get better at any effort we undertake

Bandura: Self efficacy theory

Lord Kelvin: “If you cannot measure it, you cannot improve it.”
Connecting with others: social capital and reciprocation

• Social Capital – the value of social relations and the role of cooperation and confidence to get collective or economic results

• People tend to return favours (reciprocate)
  – Fehr et al, 2002
Modeling interpersonal relationships

• Trust models
  – To recommend suitable items for the individual
  – To build communities of trusted peers
  – To increase trust in recommendations, in community, in the system → increase participation

• Focus on the symmetry / balance of relations
  – Use it to provide feedback to the user
  – Social visualizations of relationships to motivate reciprocation
Trust and reputation

- **Trust**: *subjective* evaluation of the reliability, quality, competence which one agent has of another agent based in its own experiences and interactions.

- **Reputation**: *objective* evaluation of the reliability, quality, competence which one agent has of another agent based on the experience of many agents.
Trust is dynamic

Simple trust update formula: reinforcement learning

\[ T_{\text{new}} = \alpha \cdot T_{\text{old}} + (1-\alpha) \cdot \varepsilon, \]

where \( \varepsilon \) – the new evidence,
\( \alpha \) – conservatism

- **Gossiping:**
  - two agents sharing their trust values about a third agent

- **Two kinds of trust:**
  - Basic - in an agent as provider of a service
  - Referral - in an agent as a referee (gossiper) – when the gossiping agents have similar tastes and interests, are benevolent, and honest.
Trust can reflect different aspects (contexts)

- Combined trust vs. differentiated trust
- Computing combined trust
  - using evidence from different contexts (trust-aspects)
- Combining evidence depends on the purpose
- → Decentralized User Modeling

Updating trust from direct evidence

Let’s assume:

\[ T_{\text{old}} = 0.5 \]
\[ a = 0.5 \]
\[ e = \{-1, 1\} \]

\[ T_{\text{new}} = a \times T_{\text{old}} + (1-a) \times e \]

0.75

Trust is asymmetric

\[ T_{\text{new}} = a \cdot T_{\text{old}} + (1-a) \cdot e \]

Let’s assume:

- \( T_{\text{old}} = 0.5 \)
- \( a = 0.5 \)
- \( e = \{-1, 1\} \)
Trust is transitive

How much do you trust C?

\[ T'_{AB} = 0.8 \]

\[ T_{BC} = 0.7 \]

\[ T_{new}^{AC} = 0.524 \]

\[ T_{new}^{AC} = 0.6 \times 0.5 + 0.4 \times 0.8 \times 0.7 \]

\[ T_{old}^{AC} = 0.5 \]

\[ \alpha = 0.5 \]

\[ T_{new}^{AC} = \alpha \times T_{old}^{AC} + (1 - \alpha) \times T'_{AB} \times T_{BC} \]

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Reputation: combining trust from many referees

M’s trust in A based on referees X, Y, Z

$$ T_{\text{new}} = \alpha * T_{\text{old}} + (1 - \alpha) * \varepsilon, $$

$$ T'_{MA} = \alpha * T_{MA} + (1 - \alpha) * (T'_{MX} * T_{XA} + T'_{MY} * T_{YA} + T'_{MZ} * T_{ZA}) / 3 $$

Note that there is information loss due to the aggregation.
Community formation by trusted agents through a decentralized reputation mechanism

Minimizes information loss through Interest-based communities

Trust modeling as a social data filtering mechanism

• Trust
  – In a group / community
  – In the system
  – In another user / friend

• Computational models of trust
  – To build communities
  – To find good services
  – To find good peers
Using Trust to Filter Social Updates

• P2P social networks
  – No centralized server (repository for user data)
  – Every user has a client/agent that computes the trust relationships with friends
  – The client forwards updates the trust of the user to her friends depending on different aspects (e.g. sports, news, science...)
  – Protects user from information overload, keeps user privacy from spam
  – User remains in control of her data, stored securely on the cloud
Visualizing the relationships that influence the recommendations

KeepUP! – RSS social recommender
- social visualization reveals who influences your recommended feeds
- you can change their degree of influence through the visualization

Personal Learning Network?

Social Visualizations for Reciprocation

The Idea: Projection, Filling the gap

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Social visualization of reciprocation

They see you
You both see each other
You see them
Unknowns

“Visibility” Values

From her viewpoint

How transparent is A from B’s point of view?

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Evaluation results

• Comtella-D discussion forum, 2006
• User actions signifying reciprocation:
  – comments of posts
  – ratings
  – views (weaker evidence)
• In controlled experiment the treatment group
  – logged in more frequently (significant)
  – engaged in more reciprocal relationships (significant)

Connecting to others: is there something more to it?

• The common bond theory makes predictions about the causes and consequences of people’s attachment to individual group members.

• Design recommendations:
  – (Kraut, Ren, Kiesler, 2007): Bond-based communities should phrase their mission statements to encourage members to engage in and to tolerate conversations on wide-ranging topics, and would improve if the numbers of participants were limited, and if they had mechanisms for private communication and identifying members”
FlowerVis

• Attempt to motivate users to comment on posts
• Flower-garden metaphor; petals point to users whose posts the user has commented

Being part of a something bigger than yourself

- Common Identity Theory makes predictions about the causes and consequences of people’s attachment to the group as a whole

- Recommendations for design:
  - (Kraut, Ren, Kiesler, 2007):
    “Identity-based communities should have clear mission statements and policies to keep conversation on topic, can tolerate anonymity and large numbers of participants, and can conduct all communication in public forums."
Evaluation

- It didn’t work
  - Users understood the visualization, but stated that they won’t be motivated to contribute more of the kind of stories that are needed by the community
  - Several users indicated preference for earning reputation by collecting ratings by others
  - Several users indicated that they would be motivated more by the comments of other users (seeking common bond?)
Lessons Learned

• It is much harder to design successful mechanisms based on intrinsic / gentle approaches

• Individual differences in motivation play a big role
  → Need for individual interventions (e.g. personal messages, Harper et al, 2007)
  → More place for user modeling and personalization
  → The environment can look differently for different users, and still they participate in the same community, or play the same game...
Future trends

• Combining Different Incentive Mechanisms in One System with Personalized Challenges and Rewards

• Adaptive Incentive Mechanisms
  – To the needs of the entire community
  – To the motivations of the individual users (personalized)

• Blurring the Boundary Between Real and Virtual:
  – Mechanism design and persuasion
  – Reality multi-player games
Trends for gamification of education

• **Educational Reality Games:** Re-design reality to look like a computer game, e.g. WoW.
  → Example: Quest to Learn: [www.q2l.com](http://www.q2l.com)
  – Experimental, 1 school in NYC
  – Explore and conquer overcoming challenges set individually for each student, in groups
  – Strongly inspired by multi-player online games, like WoW
  – [http://www.instituteofplay.org](http://www.instituteofplay.org)

• **Reinventing Old Games**
  – Credit and grading systems in traditional school are games
  – IT MUST BE DONE! The walls of the traditional schools are crumbling down due to the abundance of excellent and free online educational materials and courses
WHAT'S GOING ON?

Quest to Learn is a school for digital kids. It is a community where students learn to see the world as composed of many different kinds of systems. It is a place to play, invent, grow, and explore.

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For weekly updates, check out the Q2L Relay!
Reinventing old games

• Grading coursework
  – Would students do useful coursework that brings no grades?

• Peer-review systems
  – Would calculating and visualizing reputation of reviewers, based on author’s feedback improve the quality of reviews?
The future of social learning environments

- Personal Learning Networks connected together
- Massive Multi-Learner Online Games
- Collaborative exploration of the vast space of online learning materials
- Personalized challenges, feedback, rewards
- Needs:
  - system for generally recognized learner identity
  - keeping learner scores and credentials (e-portfolios)
  - decentralized – to avoid becoming property of Google / Facebook / Microsoft / Stanford / MIT
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