Incentive Mechanisms for Encouraging Participation in Online Communities

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Outline

- Introduction: why is participation important?
- Comtella 2002-2007: a sharing community
- Approaches for motivating participation:
  - Social incentives: awareness
    stimulating reciprocity
    status
  - Rewards : money → power
    pleasing effects of actions
- Conclusions

Online communities

- **Large interest based communities**
  - Usenet discussion groups
  - Blogs: LifeJournal, MySpace, Blogger, etc.
  - Game communities: e.g. *World of Warcraft, Second Life, EverQuest*
  - Sharing communities: filesharing (*BitTorrent*), digital photos (*Flickr*), bookmarks (*CiteULike*)
  - Social networking: *Orkut, LinkedIn, OpenBC*
- **Small custom-made communities for particular purpose, e.g. knowledge management**
  - Expertise finding in enterprises, or peer-help systems in education, e.g. *I-Help*
  - Sharing resources, e.g. lecture notes, papers within a research lab/group, e.g. *Comtella*
- **Network effects**:
  - more users - more diverse and interesting materials - more users….
  - less users - nothing is happening - those who come by chance leave…
  - Feedback loop!
  - After reaching a "critical mass" of participation, the community becomes self-sustained

Reaching critical mass

- By chance:
  - YouTube, mySpace, Flickr, Wikipedia,
- By purchase:
  - *YouTube* – by Google $1.6 billion in Oct 2006,
  - *Flickr* by Yahoo in 2005, …
  - $$$$$$$$$
- **By design:**
  - **build incentives in the software, e.g Slashdot**

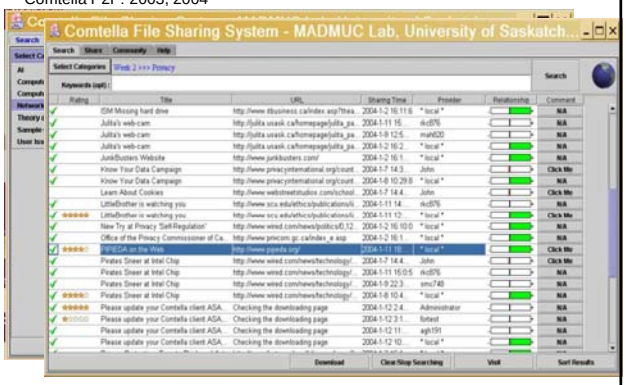
Incentives to participate

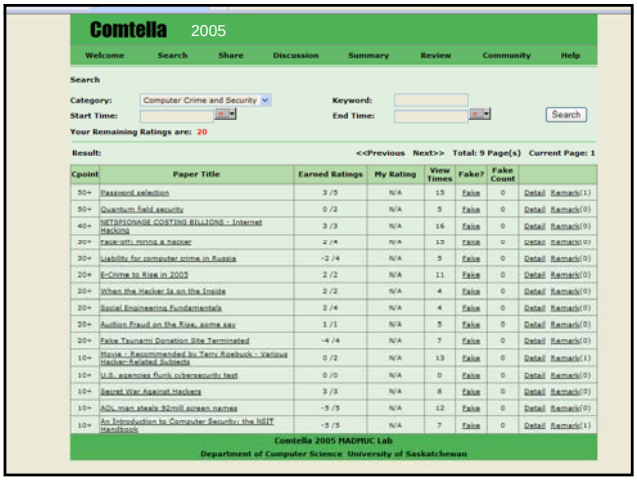
- People try to maximize utility
  - they choose to do what is rewarding
- Rewards can be different
  - Intrinsic rewards – contributing to a shared cause, expressing oneself, aesthetic pleasure
  - Extrinsic rewards – money, marks
  - Social rewards – status, power, networking, reciprocation

Comtella: History

Year	Technology	What is shared	Community	Incentive approach	Publications
2002-03	P2P	papers (files)	research lab	Community visualization	(Vass.@ CoopIS'02) Bretzke & Vass.@ UM'03)
2004	Centralized P2P	Links to papers	class	Com. visualization Social Status	(Cheng+Vass.@ ITS2004) (Cheng+Vass.@HICSS05) (Sun+Vass.@ CRIWG2006)
2005	Web-server-based	Links to papers	class	Com visualization Status with adaptive rewards Currency → power	(Cheng+Vass.UMUAI 2006) (Sun+Vass., submitted)
2006	Web-server-based	Links and Discussion	class	Visualization of relationships Immediate gratification for desirable actions	(Webster & Vass, AH2006)

Comtella P2P: 2003, 2004





Incentive Approach

- Social awareness

Theories in social psychology

Social Conformity – Asch

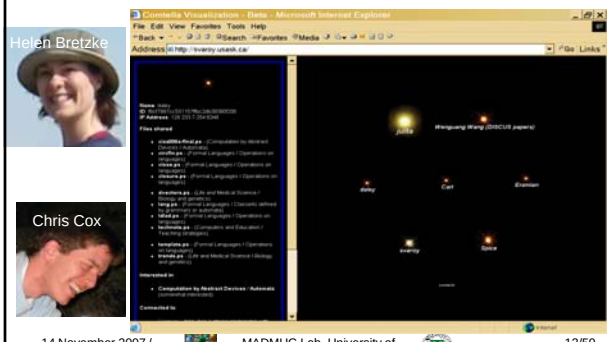
- People want to fit in their peer group: e.g. have similar ideas, do similar things

Social Comparison – Leon Festinger

- People tend to compare with their peer group
- Knowing that their peers may align to them, they behave more responsibly,
  care about positive social image and status

Real versus Online Communities – MovieLens experiment

Community visualization in Comtella 2002

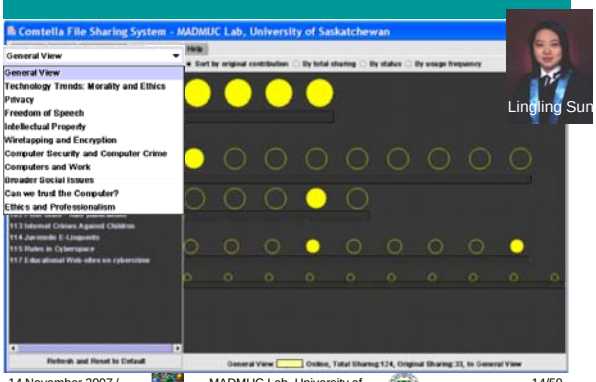


Lessons learned

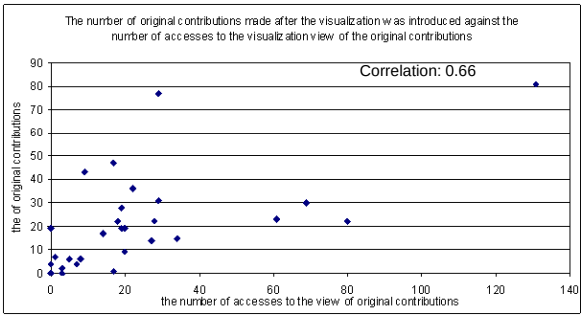
Deployed in our Department, 2 months, ~20 users, fall 2003
User Feedback:
- Visualization is “a nice feature”
- “Useful: easy to discover who has what…interesting”

- Major problems
  - Shows only users that are currently online (emphasizes loneliness)
  - Size depends on who is active at the moment
  - Uninteresting to compare the contributions of people interested in very different areas (peer group?)
  - Random graphical location, but users tried to interpret the position
  - Hard to distinguish between sizes of stars
  - Hard to keep in mind what colour means
  - Lacks interactivity

Comtella 2004: interactive vis.



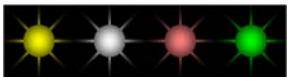
Evaluation: # new contributions Vs. visualization usage



Lessons learned

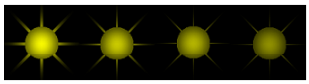
- Interactivity not used
  - Default view (original contrib.) most important
- Stars need to be more attractive
- Quality needs to be rewarded, not just quantity of contributions
  - Need to find a way to visualize “user reputation”

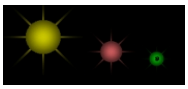
Comtella 2005 visualization



Colour (4) – membership (status)

Brightness (4) – reputation (quality of contributions)

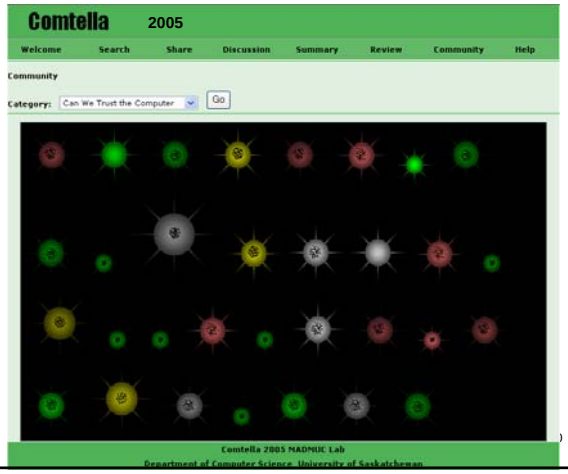




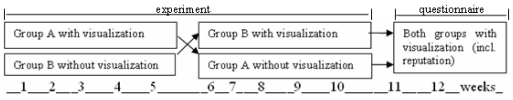
Size (4) – number of original contributions

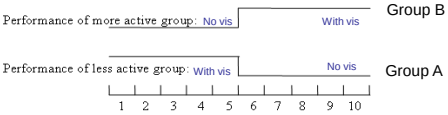
State (2) – offline or online

128 images generated using OpenGL with parameters:
- size, colour, temperature/brightness

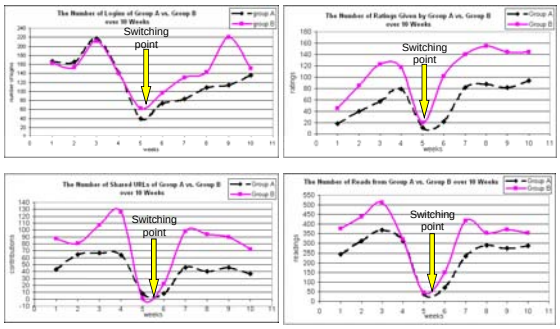


Comtella 2005 Vis. Evaluation

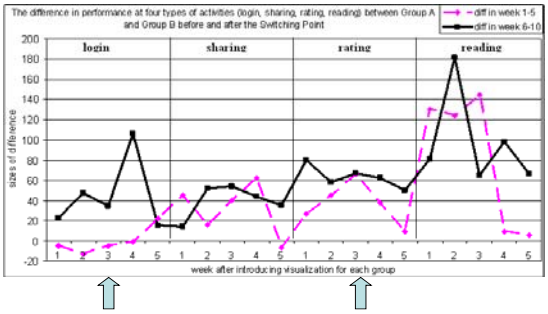




Data



Data



Results

- Statistical tests (t-Distribution Test and Wilcoxon's Matched Pairs Signed Rank Test) show that the difference between the performances of the two groups is **significant** for all activities together,
  - Statistical significance for **logging in** (0.95 for both t-test and Wilcoxon) and **rating** activities (0.975 for t-test and 0.95 for Wilcoxon)
  - No statistical significance for *sharing* and reading activities.
- The visualization has a positive effect on increasing participation but not exactly as expected

Incentive approach: Status

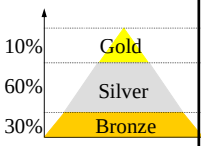
Customer Loyalty Programs

Social psychology again

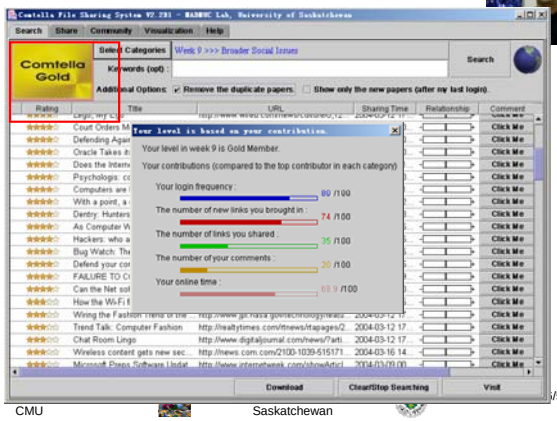
- Theory of Discrete Emotions: **FEAR**
  - When people are afraid of loosing something, they are very sensitive to messages about how to avoid the danger

Incentive mechanism in Comtella 2004

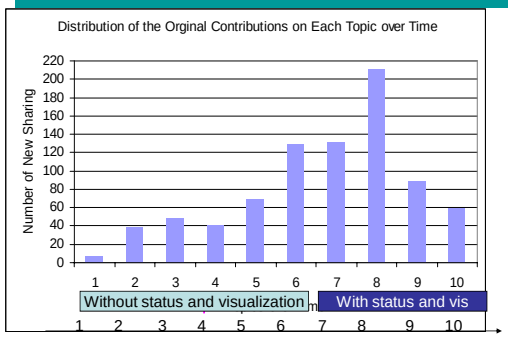
- Rewarding participatory acts with points and status
  - The user earns points by:
    - sharing new links, rating links, etc.
  - Points accumulate and result in higher status for the user



- Memberships:



Results: group contributions



Lessons learned

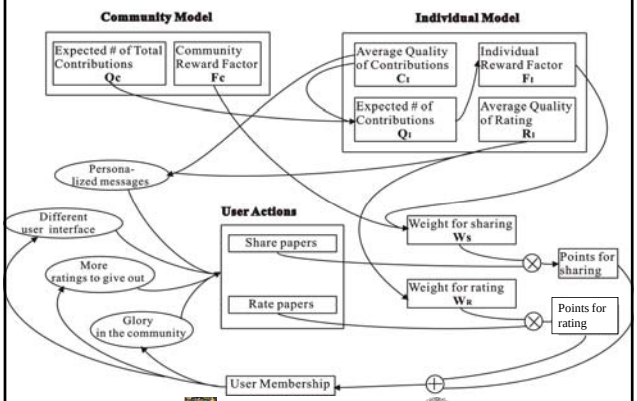
- User Status is very effective in increasing participation in sharing new papers, **but**
  - stimulated low quality papers; excessive number of contributions, students gaming the system
  - need to stimulate contributions early in the week

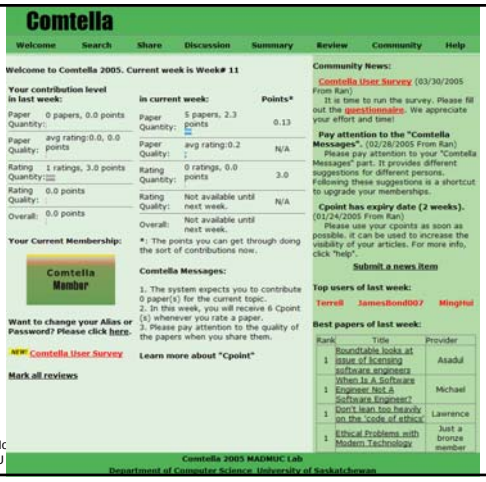
Sun, L., Vassileva, J. (2006) Social Visualization Encouraging Participation in Online Communities, Proc. CRIWG'06, Springer LNCS 4154, 345-363.

Cheng, R., Vassileva J. (2005) User Motivation and Persuasion Strategy in P2P Communities, Proc. HICSS'38, Minitrack on Online Communities, IEEE Press.

Adaptive incentive mechanism: requirements

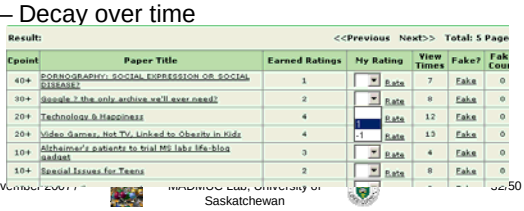
- To ensure sustainability, the incentive mechanism needs to:
  - Reward contribution of new resources, but
  - Encourage **timely contributions**
  - **Discourage excessive** contribution
  - Encourage **high quality contributions**
    - Ensure a way to **measure the quality** of contributions → reward ratings





Extrinsic incentive for rating

- Currency as payment for rating - C-points
  - Earned with each act of rating
  - Can be invested to "sponsor" own links (like Google's sponsored links)
  - Decay over time



Comtella 2005 Evaluation

- Comtella used in the "Ethics and IT" class
  - 32 students, divided into:

Test Group: with status, adaptive rewards, c-points, personalized messages

Control Group: with status

1 2 3 4 5 6 7 8 9 10 → topics

- Compared the numbers of contributions in each group (links, ratings)
- Post-study online questionnaire

Comtella 2005 - Results

- Did the users in the test group (Comtella 1) give more ratings?
  - **Yes:** nearly twice as much as Comtella 2: 1065 vs. 613 ratings (significant)
- Did the summative ratings in Comtella 1 reflect better the quality of the contributed links?
  - **Yes:** in Comtella 1, 56% (9 users) felt that the final summative ratings that their links received reflect fairly their quality, while in Comtella 2, only 25% (4 users) thought so.
- Did the users in Comtella 1 tend to share links earlier in the week?
  - **Yes:** users in Comtella 1 shared 71.3% of their contributions in the first 3 days after introducing the topic; users in Comtella 2 shared 60.6% of their contributions in the first 3 days.
    The difference was significant for all topics and ranged between 7-14%.

Comtella 2005 - Results (2)

- Did the users in Comtella 1 participate more actively in general?
  - **Yes:** they **read more papers** (3419 vs. 2416) and **logged in the system** more frequently (1714 vs. 982).
- Is there a significant difference in the total number of contributed links between the test and the control group?
  - **No:** 613 in Comtella 1 versus 587 in Comtella 2
  - There was no excessive paper contribution in either case.

Cheng R., Vassileva J. (2006) Design and evaluation of an adaptive incentive mechanism for sustained educational online communities, User Modeling and User Adapted Interaction, 16 (2/3), 321-348.

Lessons learned

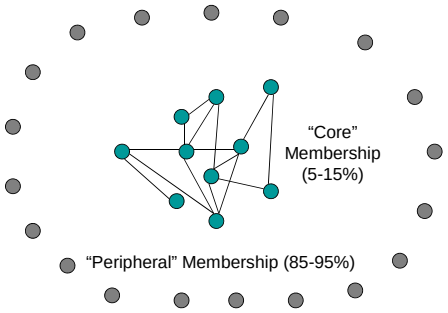
- Incorporating an incentive mechanism can stimulate a desired behaviour in an online community
  - the **c-points** stimulated ratings
    - can be useful for collaborative filtering systems
- An adaptive rewards mechanism can orchestrate a desired pattern of collective behaviour
  - the **time-adaptation** of the rewards stimulated users to make contributions earlier
- It is important to make the user aware of the rewards for different actions at any given time

Incentive approach: entangle lurkers in social relationships

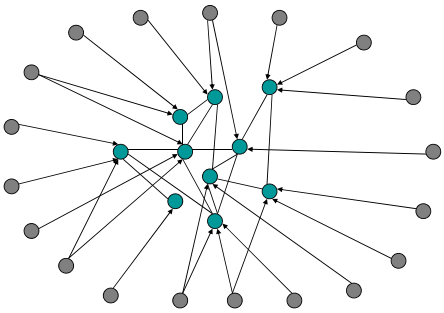
Andrew Webster

- Encouraging Social Reciprocation
  - "Who reads my postings?"
  - "What did they post?"
- Through social visualization
  - Modeling and visualizing the asymmetry of interpersonal relations
  - Expectation – that users will try to correct the asymmetry

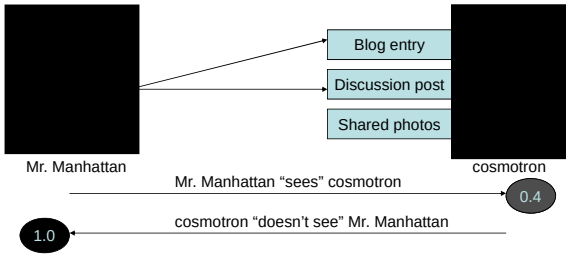
Online community composition



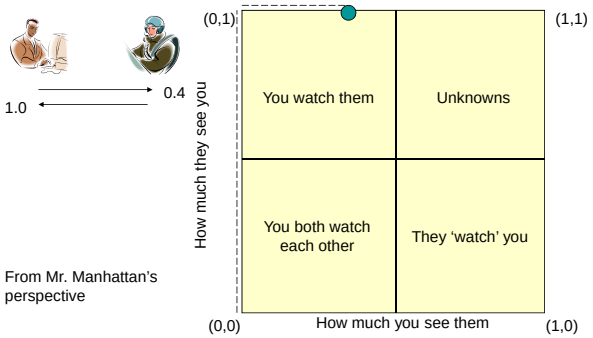
We want to "connect the dots"



Modeling relations: mutual v*isibility*



Relations visualization



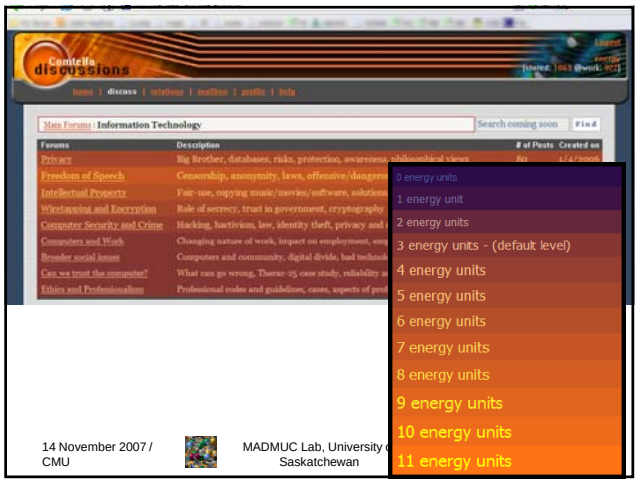
Comtella-D: 2006 Relationships visualization

Incentive Approach

Andrew Webster

- Immediately reward desirable actions
  - Rating is important
  - Reward it with esthetically pleasing effect (something "fun" to watch)
  - The user sees immediately the effect of her rating
- Emphasize what is valued in the community
  - Highly rated content is valued – emphasize it visually → generates "recommendation" in the interface (something useful, value added)
  - Gentle social comparison - based on contributions, not ego

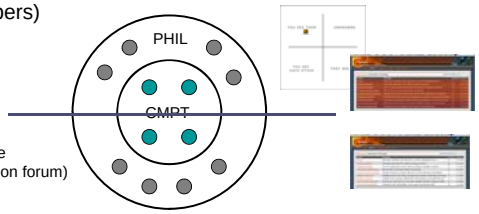
Community energy



Study: Comtella-D

- Online discussion forum for 2 courses:
  - CS 408 (required use) (N=19; simulated core)
  - Phil 236 (recommended use) (N=32; peripheral members)

Test interface



Control interface
(typical discussion forum)

Listing forums **control** interface

Listing forums **test** interface

Post header

Control Interface

Test Interface

Results

	Contribution Counts				Average Access / Views		
Group	Threads	Posts	Comments	Ratings	Logins	Reads	Relavis
CS test	72	326	17	55	66.3	233.6	4
CS ctrl	60	299	5	11	48.6	180.2	n/a
Phil test	6	10	0	6	15.9	28.1	1.1
Phil ctrl	1	6	1	4	7.9	19.2	n/a

Significant, $p<0.02$

More results

- Counted the number of interactions between members of the groups: core (test), core (control), periphery (test), periphery (control).
  - Periphery test users interacted more often with the core group than periphery control users ($p<0.01$)
  - Within the core group, members of the test group engaged in more symmetrical relations

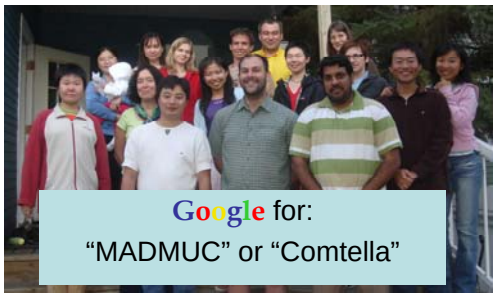
Claims and questions

- The users' behavior can be dynamically "orchestrated" by
  - Providing social awareness through visualization
  - Providing explicit rewards (status, power, esthetic pleasure, social binding) for desired user activities
  - Adapting the rewards according to what activities are currently needed most by the community.
- What should be the "score"?

Summary

- Motivating participation is an interesting and under-explored area in social computing
- On the cross-roads of:
  - Economics (mechanism design)
  - Game theory
  - Social Psychology
  - HCI
  - Distributed AI
  - Applications – in education, online communities and game design, web 2.0, enterprise 2.0 etc…
- In this talk I presented a spectrum of approaches
  - All were successful (encouraged participation)
  - Choosing one is a matter of beliefs and knowledge of the community

More Info?
http://bistrica.usask.ca/madmuc



Evaluation

- The hypothesis is confirmed by the results:
  - The inactive group becomes more active when it has access to the visualization, while the active group remains the same without the visualization
    - → The difference between the performance of the two groups shrinks
  - The inactive group becomes less active when it did not have access to the visualization, and the active group becomes more active when it had the visualization →
    - The difference between the performance of the two groups increases
- Statistical tests (t-Distribution Test and Wilcoxon's Matched Pairs Signed Rank Test) show that the difference between the performances of the two groups is **significant** for all activities, i.e. it is not due to chance or randomness -> **it is a result of applying the visualization**.
  - Statistical significance for logging in (0.95 for both t-test and Wilcoxon) and rating activities (0.975 for t-test and 0.95 for Wilcoxon)
  - No statistical significance for sharing and reading activities.
- The visualization has a positive effect on increasing participation