Personalized Motivation-supportive Messages for Increasing Participation in Crowd-civic Systems

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CSCW 2018
Crowd-civic systems support citizens who work together to collect local knowledge, discover social issues, or reform official policies.

(McInnis et. al., CSCW 2017)
Local Problem Reporting
Crowdsourced Policymaking

Off-road traffic law crowdsourcing in Finland [Aitamurto 2016]
A Crowd-Civic Challenge: Recruitment and Participation
A Crowd-Civic Challenge: Recruitment and Participation

Critical mass
A Crowd-Civic Challenge: Recruitment and Participation
A Crowd-Civic Challenge: Recruitment and Participation

Diverse personalities
A Crowd-Civic Challenge: Recruitment and Participation

Self-selection bias

[Aitamurto 2016]

Democratic Representativeness?
Diverse Motivations to Participate Voluntarily

How to move on from “one size fits all”?

[Aitamurto & Saldivar 2017]
Research Question

Can motivation-supportive design, especially when personalized, increase participation in a crowd-civic system?
Approach: Theory-based Interface Design

Personality-targeted Design

Motivation theory

Study 1

Study 2

Discussion
Personality-targeted Design

UI personalized to match a user’s personality

Self-Determination Theory (SDT)

Motivational orientations = lasting aspects of one’s personality

How task, environment, and user factors affect motivation differences
Simplified excerpt from Figure “Taxonomy of human motivation” [Ryan 2000]
Personality-targeted Design

Motivation theory

Study 1

Study 2

Discussion
Two-part Investigation

<table>
<thead>
<tr>
<th>Study 1: Online Survey</th>
<th>Study 2: Field Study</th>
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Two-part Investigation

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Design

Image for baseline version.

Study 1 19
Design Versions

6 alternative versions based on different concepts from SDT

<table>
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<tr>
<th>Need for Autonomy</th>
<th>Need for Competence</th>
<th>Need for Relatedness</th>
</tr>
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<tbody>
<tr>
<td>Autonomous orientation</td>
<td>Impersonal orientation</td>
<td>Controlled orientation</td>
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</table>

+ Baseline
Pairwise Comparison Survey

“In which version would you personally be more likely to contribute an idea?”

Study 1 21
Pairwise Comparison Survey

“In which version would you personally be more likely to contribute an idea?”

- Version 1
- Version 2
Data Collection (N=150)

1. Preferences

A  B

→

C  D  E  F

Why did you choose that?

2. Motivation questionnaires

A B C D E F
Participants have diverse preferences

Individual preference estimate

- Control orientation
- Autonomous orientation
- Control need
- Relatedness need
- Autonomy need
- Impersonal orientation
- Baseline

Bradley-Terry Model worth estimates. ANOVA p<0.05. N=99

Study 1
Preferences correlate with motivation scores

Bradley-Terry Model worth estimates. Highlighted changes p<0.05. N=99

Study 1
Study 1 Limitations

Self-reporting (hypothetical bias)

Paid workers, possibly not representative of the general population
## Two-part Investigation

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Join us in collecting important issues and ideas for the future of our university. We need everyone's contribution!

**RECENT IDEAS**

- **Attach a 1000 W, 700 W label on the front (or side) of microwaves on campus**
  - 13 likes
  - 9 hours ago

- **Please eliminate the unnecessary advisor approval procedures**
  - 12 likes
  - 12 hours ago

- **I wish there was an air purifier in every classroom**
  - 15 likes
  - 1 day ago

- **Shuttle bus time adjustment (+ extend on weekends)**
  - 9 likes
  - 1 day ago

**IDEA DETAILS**

- **jeeeee 1 day ago**
  - I wish there was an air purifier in every classroom

- **jeeeeee 1 day ago**
  - I saw that the classrooms have a very high concentration of fine dust, but none of them have air purifiers. Do all the labs have them? I think there are many labs without air cleaners ...! I hope installation of air purifiers would increase.

- **nyanong 9 minutes ago**
  - Not just in the lecture rooms, I want to have air purifiers in the dorms as well. Corridors, toilet and shower windows are almost always open for ventilation. I use a mask when going out, but it is too troublesome to wear a mask every time I go to the bathroom or throw away garbage.

We need everyone's contribution!

Share your idea

6 other people contributed today.
Your ideas matter.

Let's share our diverse viewpoints!

Leave a comment
Treatment Conditions

Baseline  Autonomy support  Control support
Example for Different Motivation-supportive Messages

Baseline

What is your idea to make KAIST a better place? It could be about facilities, organization, social problems, ...

What's your idea in one sentence?

Describe your idea in a bit more detail...

Autonomy support

What is your idea to make KAIST a better place? It could be about facilities, organization, social problems, ...

Let's have a real impact together! Among all ideas submitted until April 12th, we will hand-pick three promising ideas, present them to the whole school, and follow up with concrete steps to support their implementation!

What's your idea in one sentence?

Describe your idea in a bit more detail...

Control support

What is your idea to make KAIST a better place? It could be about facilities, organization, social problems, ...

Participation reward: Among all contributors until April 12th, we will randomly select 10 members to win $20.

What's your idea in one sentence?

Describe your idea in a bit more detail...

3 different versions for “New Idea” screens.

Study 2
Treatment Conditions

Baseline

Autonomy support

Control support

Personalization

Study 2 31
Method

Open-call recruitment

Signup group assignment

Engagement measures

Post-survey
<table>
<thead>
<tr>
<th>Results</th>
<th>Users</th>
<th>Ideas</th>
<th>Comments</th>
<th>Likes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>120</td>
<td>72</td>
<td>62</td>
<td>357</td>
</tr>
</tbody>
</table>
No correlation between Treatment and Signup Group

Interaction count per user (N=114)

Least-squares means, GLM for Poisson distributed count data.

Study 2  34
Observations on Personalization

Using a limited number of questions to classify turned out to be inaccurate.
Post-hoc classification

→ Re-classify users based on post-survey full questionnaires (kmeans clustering).
Correlation between Treatment and Post-hoc Group

Interaction count per user (N=30)

ANOVA for number of interactions $p<0.01$ for treatment, group, and interaction; Pair comparisons, Tukey method: left-hand side all $p<0.01$, right-hand side n.s.
Study 2 Limitations

Small N for post-survey

Homogenous population (mostly Korean students)
Personality-targeted Design

Motivation theory

Study 1

Study 2

Discussion
Benefits and Challenges of Theory-based Design

SDT has proven to be a useful perspective for designing applications dealing with voluntary participation.

Translating theory to design is not an exact process.
Possibility of Personalization

Results show personalization is possible, but need to improve automatic classification.

Trade-offs:
- explicit and implicit data elicitation
- potential adverse effects
- personalization and customization
Challenges of Field Study about Motivation

Advertising study without influencing motivation

How to track diversified (offline) recruitment?
Let’s move away from “one size fits all” by designing with diverse populations’ motivations in mind.
Personalized Motivation-supportive Messages for Increasing Participation in Crowd-civic Systems

1. Survey: motivation orientation differences can explain individual preferences for different motivation-supportive designs.
2. Field study: some tangible effects on actual participation but surfaced tradeoffs.
3. Combination of studies can give a more complete picture.

Open-source app and survey code: http://github.com/graup/manyideas

Paul Grau  paul@graycoding.com  Twitter: @graycoding
References for slides


Appendix
### Qualitative feedback is aligned with expectation

<table>
<thead>
<tr>
<th>Controlled Orientation</th>
<th>Autonomous Orientation</th>
<th>Impersonal Orientation</th>
<th>Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preferred by 62%</strong></td>
<td><strong>14%</strong></td>
<td><strong>3%</strong></td>
<td><strong>7%</strong></td>
</tr>
<tr>
<td>Become a Contributor of the Month! Share your idea</td>
<td>Make our community a better place! Share your idea</td>
<td>Change may be beyond our control... Share your idea</td>
<td>What’s on your mind? Share your idea</td>
</tr>
<tr>
<td>$20 gift cards for Top 5 contributors. Announcement on official website.</td>
<td>24 other people contributed today. Your ideas matter.</td>
<td>but there’s a chance someone sees your idea and considers it.</td>
<td></td>
</tr>
</tbody>
</table>

A gift card is a great incentive for someone to participate.

The chance of winning makes me more compelled to participate and try harder.

It looks more friendly.

Making things better for everyone sounds like the best plan overall.

It doesn’t try to make me feel guilty for not sharing an idea.

It’s honest.

It’s very simple and it doesn’t insult the user by talking down to them.

Having motivational quotes makes the entire program seem less serious.
Measuring People’s Underlying Motivation

General Causality Orientations Scale (GCOS) [Deci 1985]

Autonomy, Control, Impersonal

Motivation to Volunteer Scale (MVS) [Grano 2008]

Amotivation, External regulation, Introjection, Identification, Integration, Intrinsic
Overall participation

8 days, 120 users, 72 ideas, 62 comments, 357 likes
Detrimental Effects of Controlled Regulation

Post-survey data suggests additional effects.
카이스트
학식 메뉴
이것이 최선?
어떻게 해결할까요?

manyideas.org

위 URL을 방문하여
여러분의 좋은 아이디어를 공유해주세요.

4월 12일까지 참여하고
다양한 선물을 받아가세요!

카이스트 전산학부 KIXLAB에서 진행하는
"Participation for Social Good"에 관한 연구 프로젝트입니다.
Future Work

Iterate on designs
  test more versions (esp. non-external-reward ones)
  test more affordances (not just messages)

More long-term field study with larger audience
General Effectiveness of Control and Autonomous Motivation Strategies in Study 2

Both conditions increased engagement; Control significantly.

ANOVA p<0.01; post-hoc multiple comparisons with Tukey method p<0.05 for Control treatment compared to both other treatments; GLM for Poisson distributed count data.
Idea Curation

First author and one external rater from the Student Council
Criteria: Popularity + Originality + Feasibility + Depth + Discussion

- Fine Dust Mask Vending Machine
  - 14 Likes, 3 comments

- Eliminate useless advisor signature procedures
  - 13 Likes, 1 comment

- Please make a weekly vegetarian day in the cafeteria
  - 5 Likes, 3 Comments

- Eoeundong-san Underground Shopping Mall
  - 9 Likes, 4 Comments
Limitations and Alternatives for Message Personalization

Trade off: implicit/explicit elicitation, effort/benefit for user.

Can we get personality information automatically?

Privacy risks, ethical concerns, lack of autonomy?
Bradley-Terry model

Calculate probabilities for each version based on pairwise comparison data

Prefmod: R package that constructs matrix suitable for regression.

Questionnaire Examples

GCOS

You have been offered a new position in a company where you have worked for some time. The first question that is likely to come to mind is:

1) What if I can’t live up to the new responsibility? (Impersonal)

2) Will I make more at this position? (Control)

3) I wonder if the new work will be interesting. (Autonomy)

MVS
Taxonomy of Work Motivation

Influencing Factors

USER
Demographics
Causality Orientation

TASK
Characteristics
Design

PLATFORM
Incentive Mechanism
Design

CONTEXT
Physical
Social

Motivation

AMOTIVATION

EXTRINSIC
MOTIVATION

INTRINSIC
MOTIVATION

- External Regulation
- Introjected Regulation
- Identified Regulation
- Integrated Regulation
- Controlled Motivation
- Autonomous Motivation

Outcomes

PERFORMANCE
Reliability and Validity
Participation

WELL-BEING
Experiencing Self
Remembering Self
Study 1 Demographic Data (N=99)

Sex:
- Female: 35%
- Male: 65%

Education:
- HS/GED: 18%
- College: 35%
- Bachelor: 40%
- Master: 6%

Age:
- 18-26: 18%
- 27-32: 33%
- 33-40: 23%
- 41-55: 21%
- 56+: 4%
Study 2 Demographic Data (N=120)
Study 1 Test Scores (N=99)
Study 2 Test Scores (N=38)

Motivation to Volunteer

General causality orientation

1 2 3 4 5
Amotivation  External  Introjected  Identified  Integrated  Intrinsic

1 2 3 4 5 6 7
Impersonal  Control  Autonomy
Personalization Engine Decision Tree
Study 2 Post-hoc Clusters

<table>
<thead>
<tr>
<th>Scale</th>
<th>Cl. 1</th>
<th>Cl. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsic</td>
<td>3.27</td>
<td>3.54</td>
</tr>
<tr>
<td>Integrated</td>
<td>3.10</td>
<td>3.15</td>
</tr>
<tr>
<td>Identified</td>
<td>3.04</td>
<td>3.76</td>
</tr>
<tr>
<td>Introjected</td>
<td>3.35</td>
<td>2.33</td>
</tr>
<tr>
<td>External</td>
<td>3.27</td>
<td>2.40</td>
</tr>
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<td>3.55</td>
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