Crowd-powered Creativity Support

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The Broad Picture

AI and Automation

Humans excel in creativity

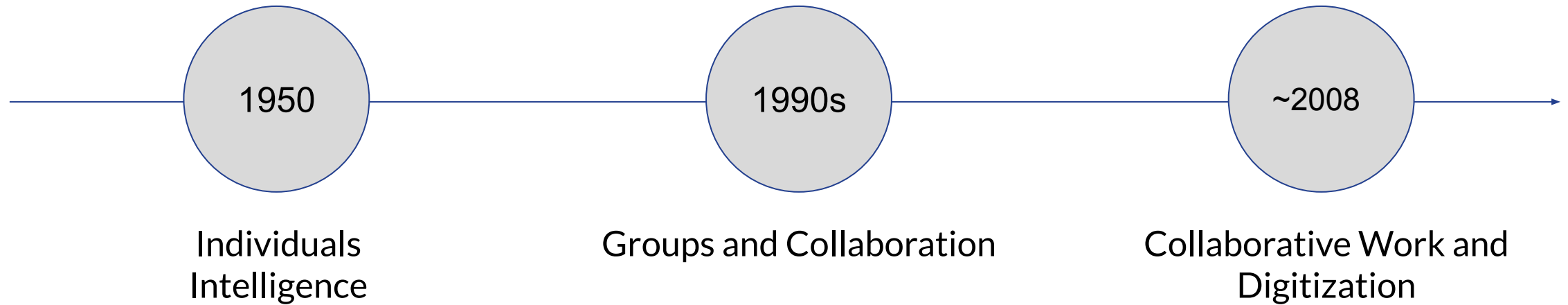**Humans as first-class citizens in future value chains and complex systems**

GET THE CREATIVITY FLOWING
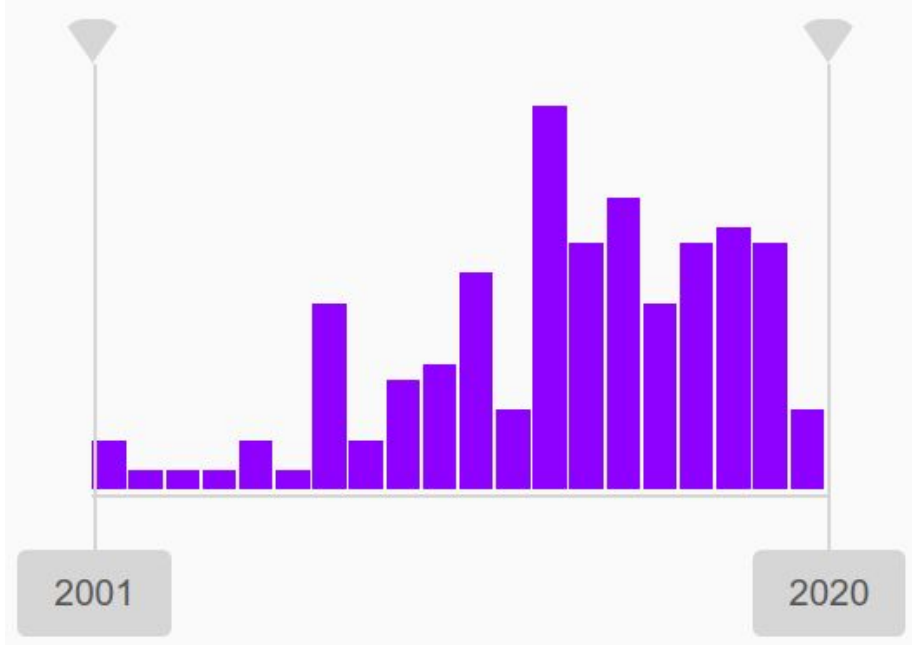
"How can we harness the collective creativity of non-expert crowd workers in the creative process?"

Creativity in HCI Research: Three Waves

1950 — Individuals Intelligence

1990s — Groups and Collaboration

~2008 — Collaborative Work and Digitization

Creativity Support as a Grand Challenge*

* Shneiderman, Ben. "Creativity support tools: A grand challenge for HCI researchers." *Engineering the User Interface*. Springer, London, 2009.

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https://dl.acm.org/action/doSearch?AllField="creativity+support+tool"

Crowd-powered Creativity Support Tools

Crowdsourcing

Workers **Platform** **Requesters**

Jonas Oppenlaender, EICS Doctoral Consortium, June 23, 2020
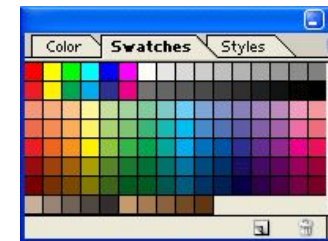
Tasks

Transcription

Annotation, Sentiment

What is your favorite color?

1   2   3

Objective tasks   **Subjective tasks**

Examples of task instructions

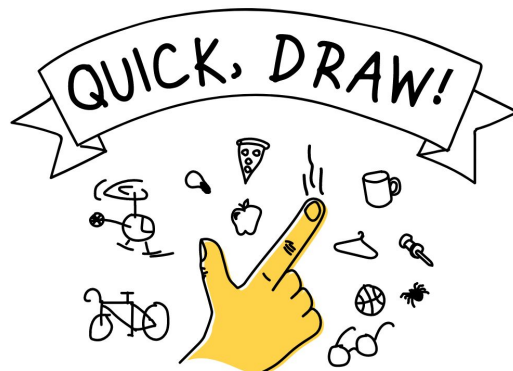"Come up with birthday messages for Mary, a firefighter who is about to turn 50"

"How can you dry many cups quickly so that they don't take up too much space [...]?"

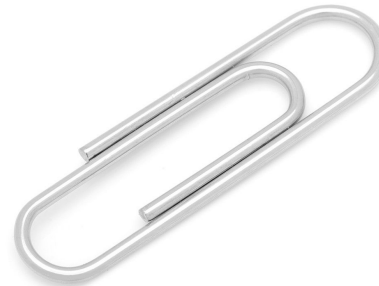"Draw a sheep facing left" or "Please design a chair for children"

"[...] think of as many unique and unusual uses for a common object"

"find a word that [is] logically linked to the set of three words"

Creative tasks

Creativity tests

QUICK, DRAW!

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Why does the workers' perspective matter?

"We tried crowdsourcing the data, but the crowd threw bogus data at us instead."

Approach

General-purpose paid crowdsourcing platforms

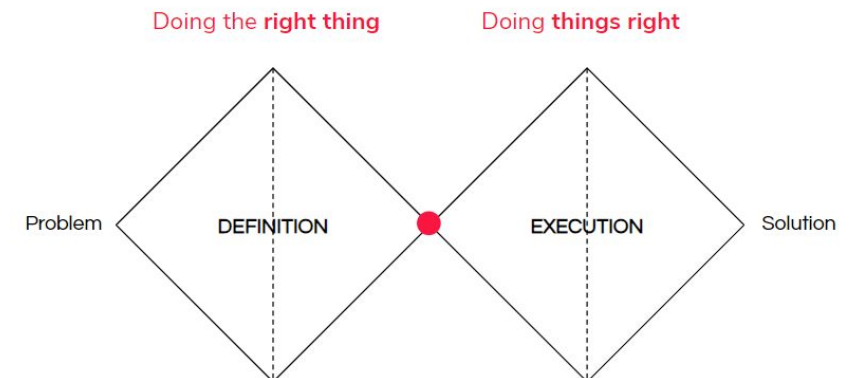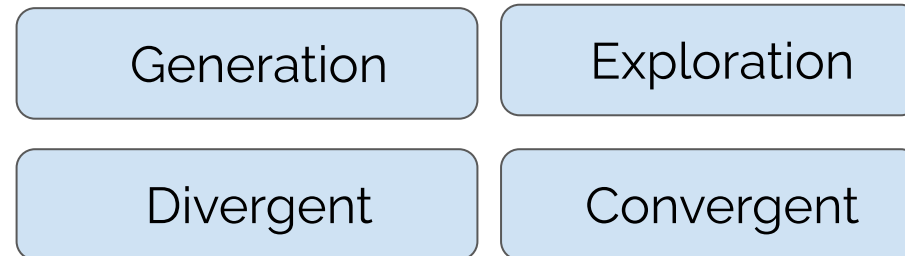**amazon mechanical turk**

Prolific

100 000 - 200 000 registered users,
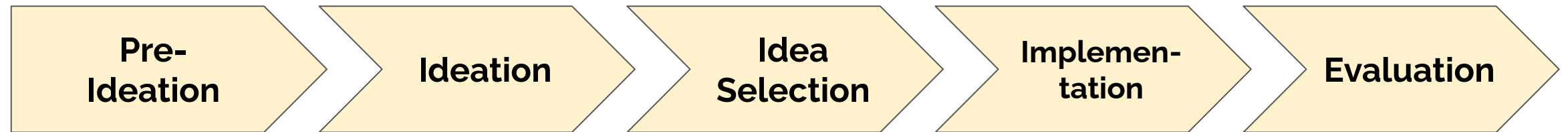2000-5000 online right now

"We've found 104,964 matching participants who have been active in the past 90 days"

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The Requester's Creative Process

Pre-Ideation → Ideation → Idea Selection → Implementation → Evaluation

Generation	Exploration
Divergent	Convergent

Doing the **right thing**   Doing **things right**

Problem — DEFINITION — EXECUTION — Solution

PhD Status

1 journal article

3 conference papers article

1 manuscript

The Requester's Creative Process

Creativity on Paid Crowdsourcing Platforms

Problem
- We do not know much about how workers experience creative work

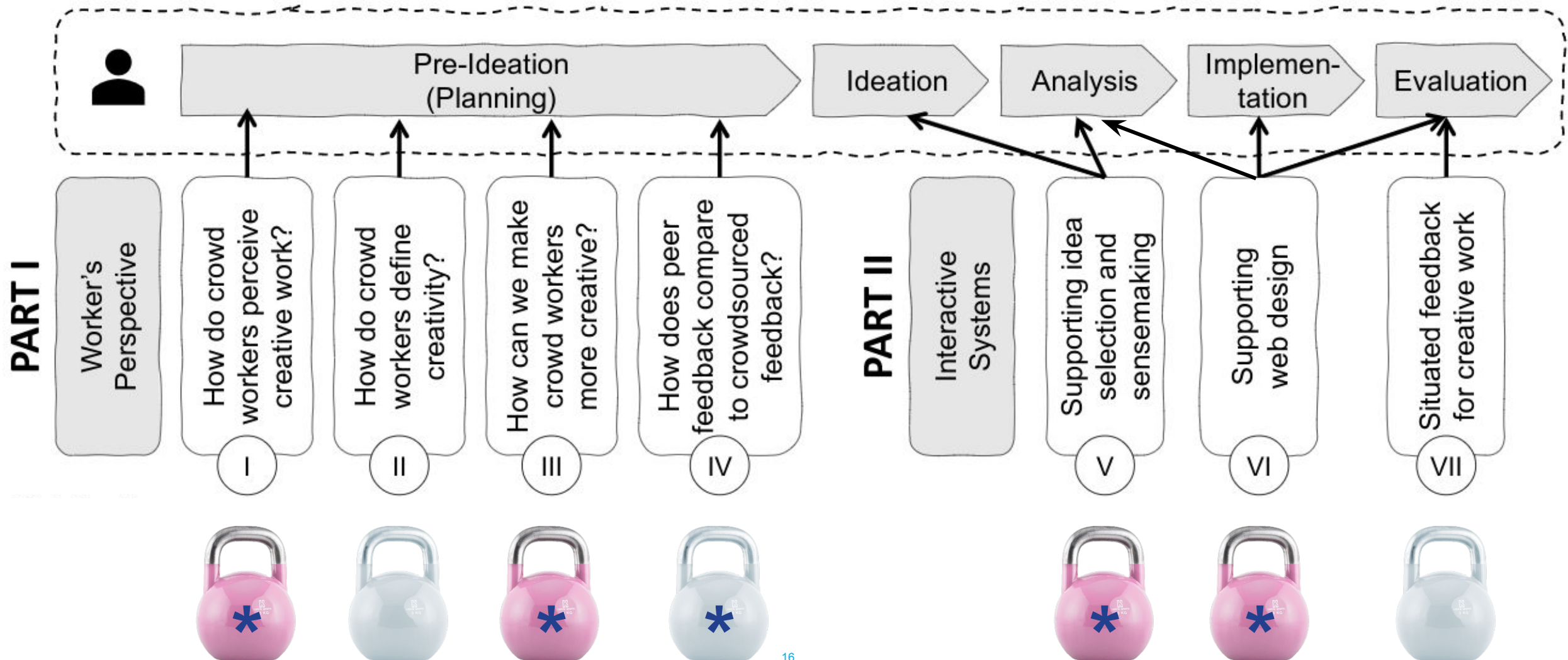**Method**
- Survey task on *Mechanical Turk* and *Prolific* (n = 215)

Research questions
- How do workers perceive creative work on the crowdsourcing platform?
- What are the workers' preferences?
- What are the differences between the two investigated platforms?

Jonas Oppenlaender, Kristy Milland, Aku Visuri, Panos Ipeirotis, and Simo Hosio. 2020. Creativity on Paid Crowdsourcing Platforms. In Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (CHI '20). Association for Computing Machinery, New York, NY, USA, 1–14. DOI:https://doi.org/10.1145/3313831.3376677

Creativity on Paid Crowdsourcing Platforms

On 34 things such as...

Why and how do you work on <platform>?

How do you define creativity yourself?

What planet do we live on?

How often have you seen creative tasks and/or tests on <platform>?

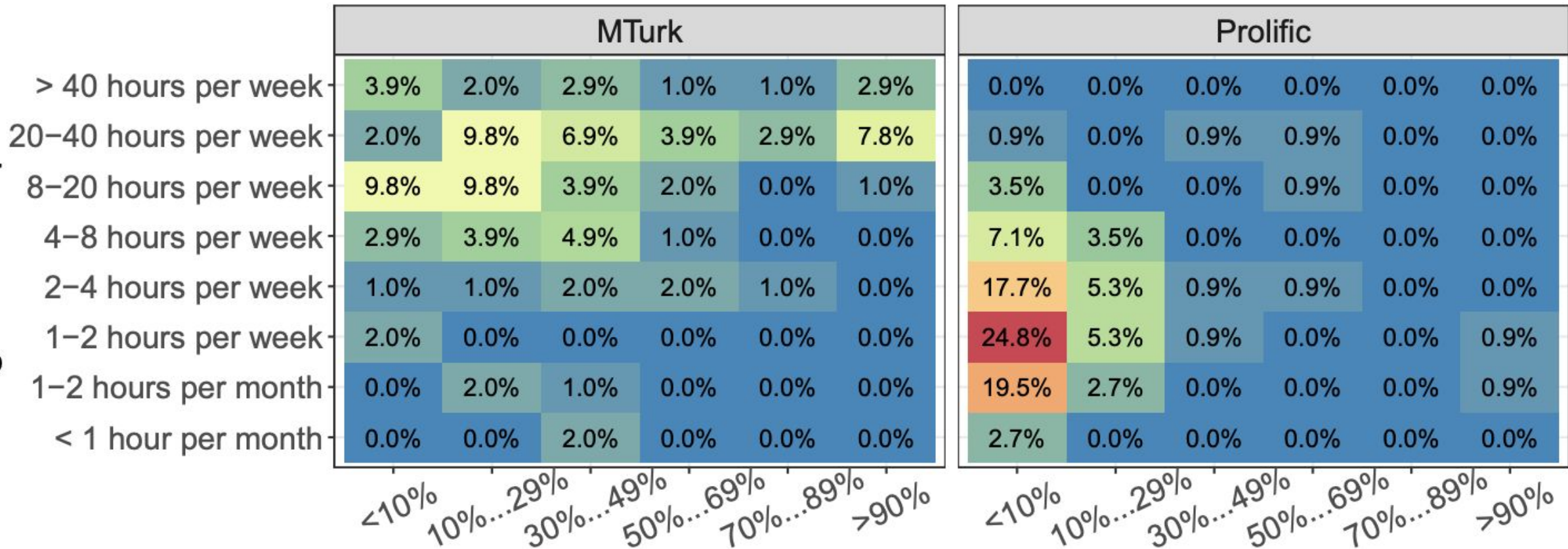What's your stance on collaborative (N>2) work?

...followed by a mixed-method analysis
(thematic analysis/grounded theory)

(it was a long questionnaire, see the paper)

Creativity on Paid Crowdsourcing Platforms

Creativity on Paid Crowdsourcing Platforms

Key contributions

- Five worker archetypes, based on different perceptions and attitudes towards creative work

PROFESSIONAL	CASUAL	NOVELTY SEEKER	SELF-DEVELOPER	PRAGMATIC WORKER

- 90% of workers preferred to work alone

- Evidence for nonnaïveté of crowd workers in regard to commonly used creativity tests

Design Recommendations for Computational Priming

Problem

- Workers may not be in the "right mood" for creative work

Research question

- How can we make crowd workers more creative?
  → Computational priming: Assign roles to workers

- Which of three given assignment strategies is best?
  - Choose one role
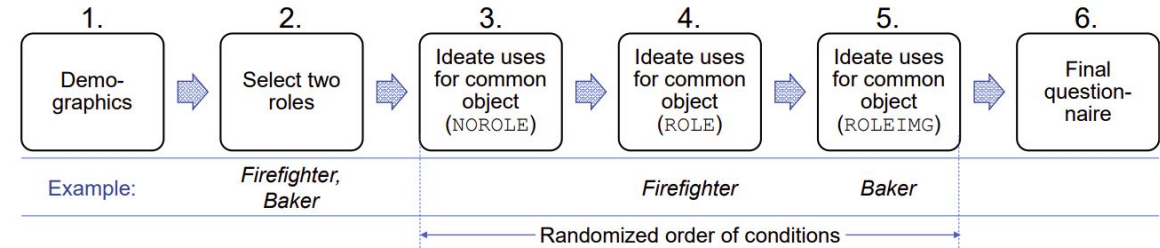 - Choose multiple roles
  - Be assigned a role

Jonas Oppenlaender and Simo Hosio. 2019. Design recommendations for augmenting creative tasks with computational priming. In Proceedings of the 18th International Conference on Mobile and Ubiquitous Multimedia (MUM '19). Association for Computing Machinery, New York, NY, USA, Article 35, 1-13. DOI:https://doi.org/10.1145/3365610.3365621

Design Recommendations for Computational Priming

Method

- Within-subject experiment on Prolific (n = 60)

- Alternative uses task with brick/paperclip

- Measure "unusualness" of ideas

- Evaluation on MTurk: 120 randomly sampled triplets, pick the most unusual idea

- Supplemented with interviews (n = 8)

Design Recommendations for Computational Priming

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	Task	NOROLE	ROLE	ROLEIMG	Disagree-ment
Idea count	Brick	18	17	18	7
	Paperclip	16	17	22	5
Idea length	Brick	9.53	$10.16^{\dagger}$	$10.89^{\dagger}$	
	Paperclip	8.15	9.85^{*}	10.31^{*}	

$\dagger$ ($p > .05$), $*$ ($p < .05$)

Key Contributions

- Roles had no significant effect on crowd workers
- Qualitative insights on how roles are used
- Design recommendations for using roles:
  - A narrowly focused task may inspire more targeted ideas
  - Choose the right time point for priming
  - Let workers self-select a suitable role
  - Prevent over-commitment to the role
  - Prevent over-exposure to other contexts

Interactive Systems

Search Support for Exploratory Writing

Problem

- Supporting exploration and selection of ideas from a crowdsourced knowledge base

Methodology

- Interface with faceted sorting

Oppenlaender J., Kuosmanen E., Goncalves J., Hosio S. (2019) Search Support for Exploratory Writing. In: Lamas D., Loizides F., Nacke L., Petrie H., Winckler M., Zaphiris P. (eds) Human-Computer Interaction – INTERACT 2019. INTERACT 2019. Lecture Notes in Computer Science, vol 11748. Springer, Cham

Discover treatment ideas for low back pain

Set a criteria configuration (left column), hit "query ideas" and we'll fetch you a few best-matching options!

Instructions:
! = You have not specified a value for this criterion.

Specify Criteria:

Cost (Cost to the patient)
>>>Desired level: (1-100): 1

Speed (Speed of effect)
>>>Desired level: (1-100): **!**

Duration (Duration of effect)
>>>Desired level: (1-100): **!**

Efficiency (Efficiency in general)
>>>Desired level: (1-100): 100

Query ideas!

Reset criteria

Results:

#1: Exercise in general
Distance to optimal: 39.

Exercise in this case means purpose shape / increasing fitness, or simply

#2: Stretching
Distance to optimal: 46.2.

Increasing the mobility of the back muscles, overall aiming to improve

#3: Treating secondary con
Distance to optimal: 49.9.

Treating other conditions than low obesity.

#4: Information, education
Distance to optimal: 50.2.

Information refers to making the pa reasons, different options to treat i treat the patient, but to motivate t to remedy the situation.

#5: Ergonomy
Distance to optimal: 58.

Search Support for Exploratory Writing

Methodology (continued)

- Within-subject lab experiment (n=24): Comparison with Google Search

- Short task: write an "article" about combination of two criteria

- Semi-structured interviews & thematic analysis
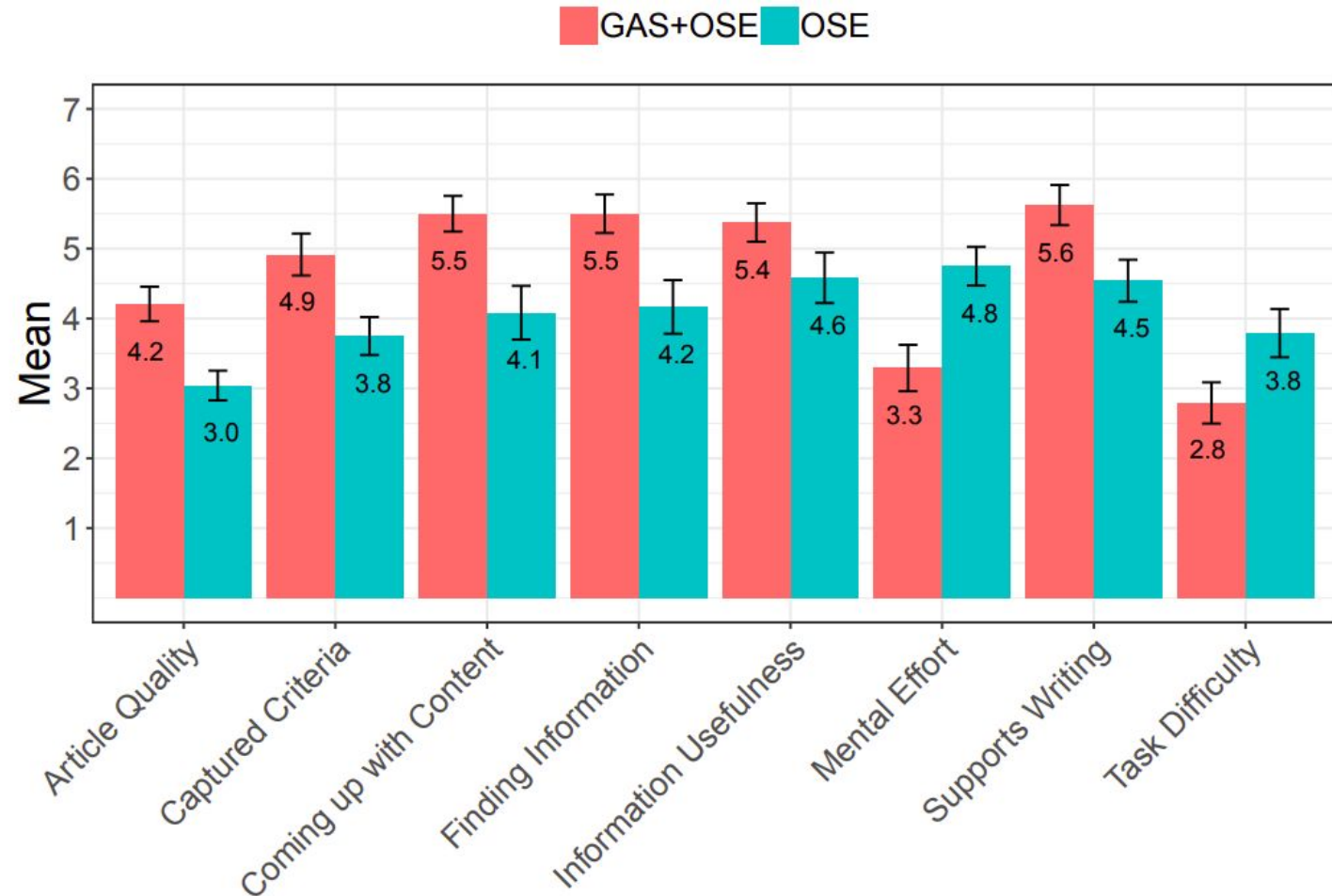
Search Support for Exploratory Writing

Key Contributions

- System outperformed Google in supporting complex queries

- Several strategies for inception of ideas
  - source of information
  - prior knowledge
  - develop structure
  - hybrid

CrowdUI: Crowdsourced Web Design

Problem

- Web design is complex and design for a common denominator interface is difficult

- Crowd could help, but...

    - Crowd workers are not designers

    - Requester needs to evaluate a large number of suggestions

Research Questions

- *Explore: How can the crowd support the design of a website?*

- *Users: What will website users suggest, and what are their motivations for modifying the UI?*

- *What benefits does a crowd-based tool provide to requesters?*
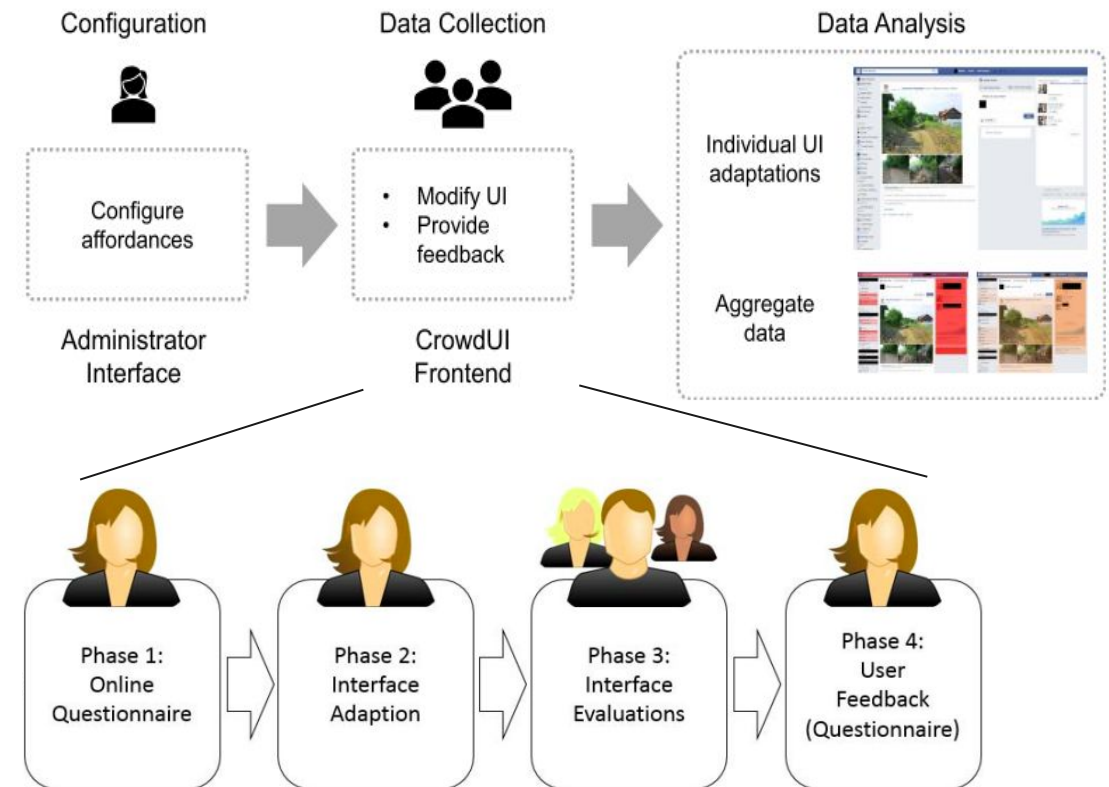
Jonas Oppenlaender, Thanassis Tiropanis, and Simo Hosio. 2020. CrowdUI: Supporting Web Design with the Crowd. Proc. ACM Hum.-Comput. Interact. 4, EICS, Article 76 (June 2020), 28 pages. DOI:https://doi.org/10.1145/3394978

CrowdUI: Crowdsourced Web Design

CrowdUI

Design and implementation of a system for *visual design feedback*

**Design rationale &
Value Proposition for Requester**

- Usability by non-experts
- Support different use cases
- Small changes must hold value
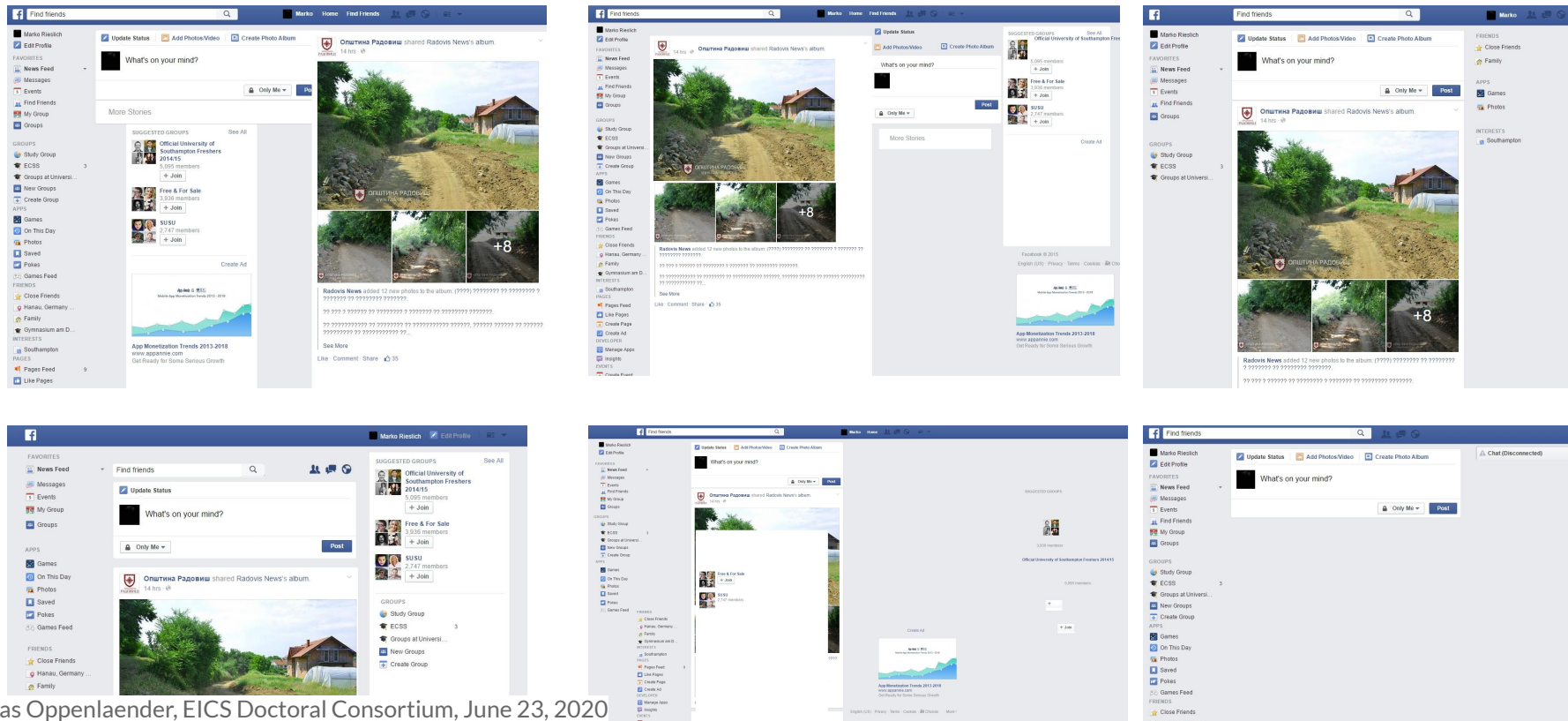
CrowdUI: Crowdsourced Web Design

Evaluation

- Facebook News Feed

- 12-day user study with 45 Facebook users

- Evaluation with 60 crowd workers (experienced in web development)

CrowdUI: Crowdsourced Web Design

Results

- Users created 62 different UI drafts

Theme	Frequency
Minor	36 (58.1%)
Major	26 (41.9%)
Finished	53 (85.5%)
Unfinished	9 (14.5%)
Layout	60 (96.8%)
Design	2 (3.2%)
Aligned	52 (83.9%)
Misaligned	10 (16.1%)
Demonetization	15 (24.2%)
Footer	21 (33.9%)
Defacing	3 (4.8%)

CrowdUI: Crowdsourced Web Design

Key Contributions

- Structured process of extracting and peer-evaluating design suggestions from different user groups enables participatory visual design feedback
- A design space for crowdsourced website design

- Study 1: Individual drafts difficult to interpret
- Study 2: Aggregation in heatmaps allows to draw actionable conclusions

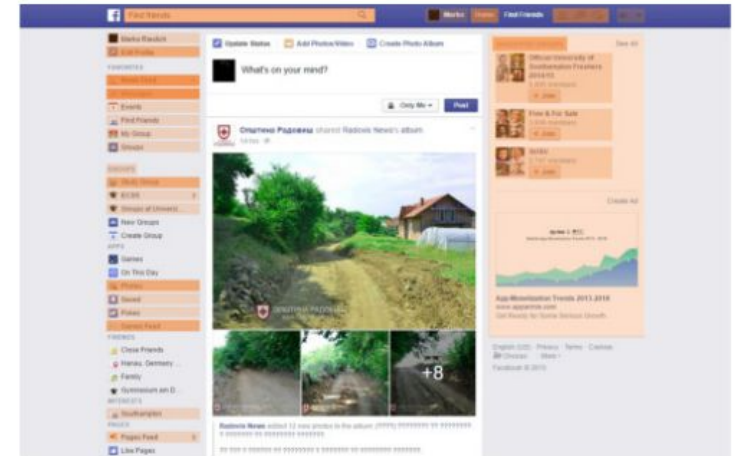| Design dimension	Definition
Object of study	Denotes what is being designed (e.g., a website, proto-type, wireframe sketch)
Primary purpose	The main purpose of the system
Stage in the design process	Whether the crowd contributes at an early or late stage in the design process (cf. formative and summative feedback)
Motivation of cro...	Denotes how the cr... is incentivised (i.e., whethe... motivation is ...sic)

CrowdUI: Crowdsourced Web Design
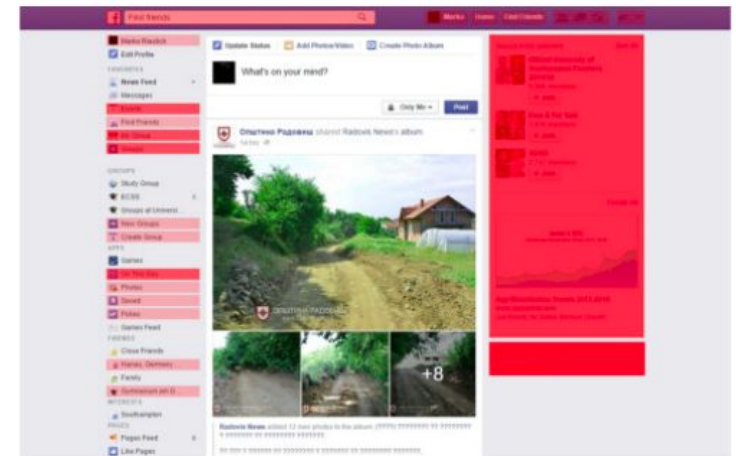
Key Contributions

- Design recommendations
  - Collecting and improving user-created drafts
    - Indicator for finished drafts
    - Let users fork drafts
  - Decoupling the evaluation of the UI from the content
  - Aggregating design suggestions for decision support
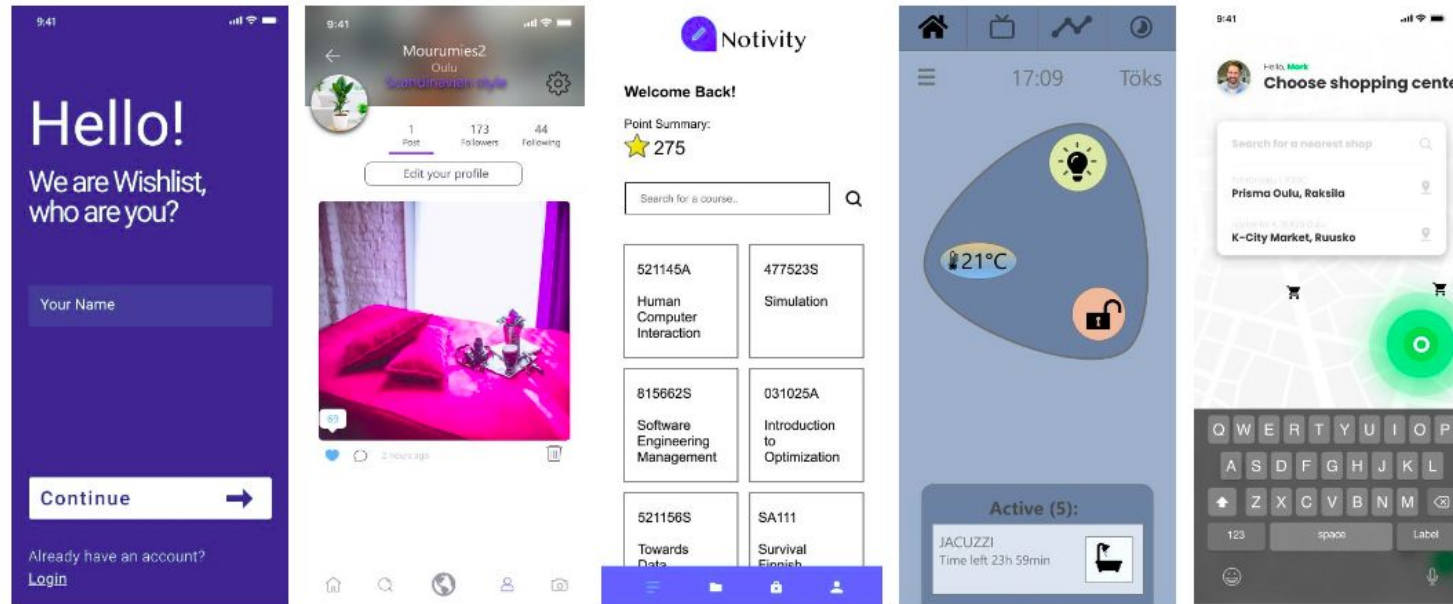
Movements

Deletions

Future Work: Comparing Crowdsourced Feedback

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Problem

- Selecting the right source of feedback
  (crowdsourcing versus peer feedback)
  - Intrinsic motivation versus extrinsic motivation

- Requester's perspective:
  Felt experience of crowdsourced feedback

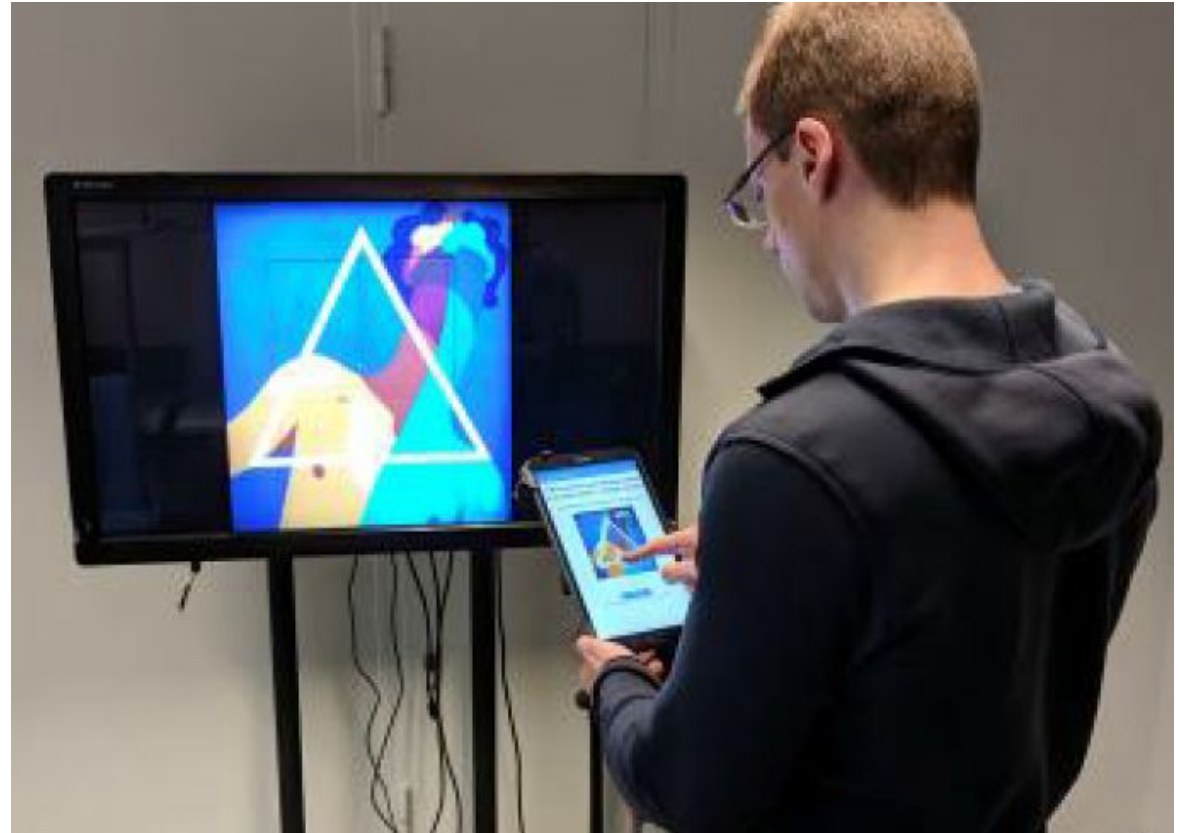# Future Work: Comparing Crowdsourced Feedback

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Method

- Students (n=106) received formative feedback from crowd and peers
- Open-ended questionnaire
  - Which feedback do you prefer?
  - Quality, effectiveness, fairness, actionability, valence, satisfaction

Future Work: Situated feedback for creative work

("Towards Eliciting Feedback for Artworks on Public Displays")

Jonas Oppenlaender and Simo Hosio. 2019. Towards Eliciting Feedback for Artworks on Public Displays. In Proceedings of the 2019 on Creativity and Cognition (C&C '19). ACM, New York, NY, USA, 562–569. DOI:https://doi.org/10.1145/3325480.3326583

Summary

- Advance the current understanding of creative work on general-purpose crowdsourcing platforms

- Common pitfalls and recommendations for requesters

- Unlock the full potential of the combination of crowdsourcing and creativity support

- Much to discover about optimally allocating creative tasks and designing creativity support tools

Thank You
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