WORKER-CENTRICITY COULD BE TODAY'S DISRUPTIVE INNOVATION IN CROWDSOURCING

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Optimize Task Assignment for Collaborative Tasks

with S. B. Roy, H. Rahman, S. Thirumuruganathan, G. Das, VLDBJ 2015

- **Input**: tasks to complete, human workers
  - A task has *skill/quality/budget* requirements
  - A worker has human factors: *skill, expected wage, acceptance ratio*
- **Output**: completed tasks

- **Goal**: Form a team of workers for each task s.t. overall quality is maximized

Example: Maximize outcome quality under task-centric and worker-centric constraints

objective: maximize aggregated v_t

$$\text{Maximize } \mathcal{V} = \Sigma_{\forall t \in T} v_t$$

aggregated worker skills and wages

task quality constraint

$$v_t = \begin{cases} W_1 \times \Sigma_{\forall j \in \{1..m\}} q_{t_j} + W_2 \times (1 - \frac{w_t}{W_t}) & \text{if } q_{t_j} \geq Q_{t_j} \\ & \wedge\ w_t \leq W_t \\ 0 & \text{if } q_{t_j} < Q_{t_j} \\ & \vee\ w_t > W_t \end{cases}$$

task budget

where $W_1, W_2 \geq 0$ and $W_1 + W_2 = 1$.

Example cont'd (IP formulation)

Worker selected or not

Worker's acceptance ratio

Worker's skill

$$q_{t_j} = \Sigma_{\forall u \in \mathcal{U}} u_t \times p_u \times u_{s_j} \geq Q_{t_j}, \forall j \in \{1..m\}$$

$$w_t = \Sigma_{\forall u \in \mathcal{U}} u_t \times p_u \times w_u \leq W_t$$

$$u_t = [0/1]$$

$$X_l \leq \Sigma_{\forall t \in T} \{u_t\} \leq X_h$$

Lower and upper bounds on worker's total number of tasks

Group-Aware Human Factors

G. Hertel and G. Hertel, Synergetic effects in working teams, Journal of Managerial Psychology 2011

Skill

Cost

+

Affinity

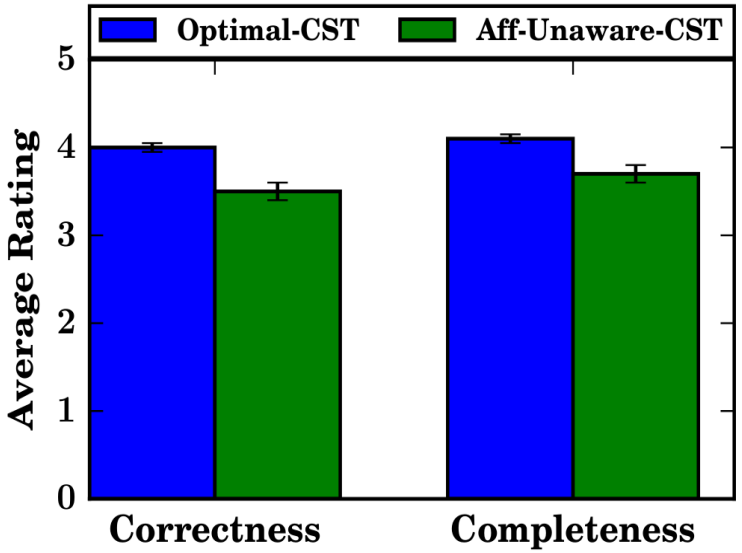
Is there an ideal group size?

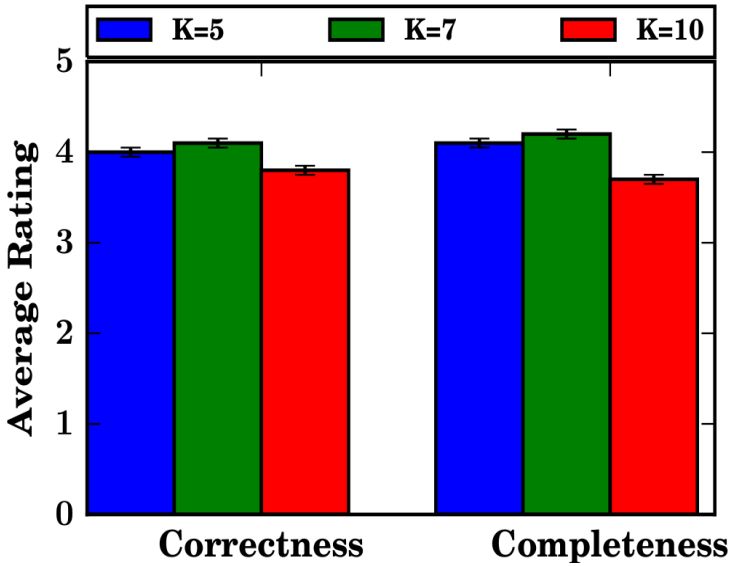
Critical Mass

Experiments with Affinity

with S. B. Roy, H. Rahman, S. Thirumuruganathan, G. Das, ICDM 2015

- Translation tasks with 120 AMT workers
- Evaluation based on Word Error Rate
  - Higher affinity impacts positively quality
  - A group beyond size 10 is less effective
  - Region-based more effective than age/ gender-based





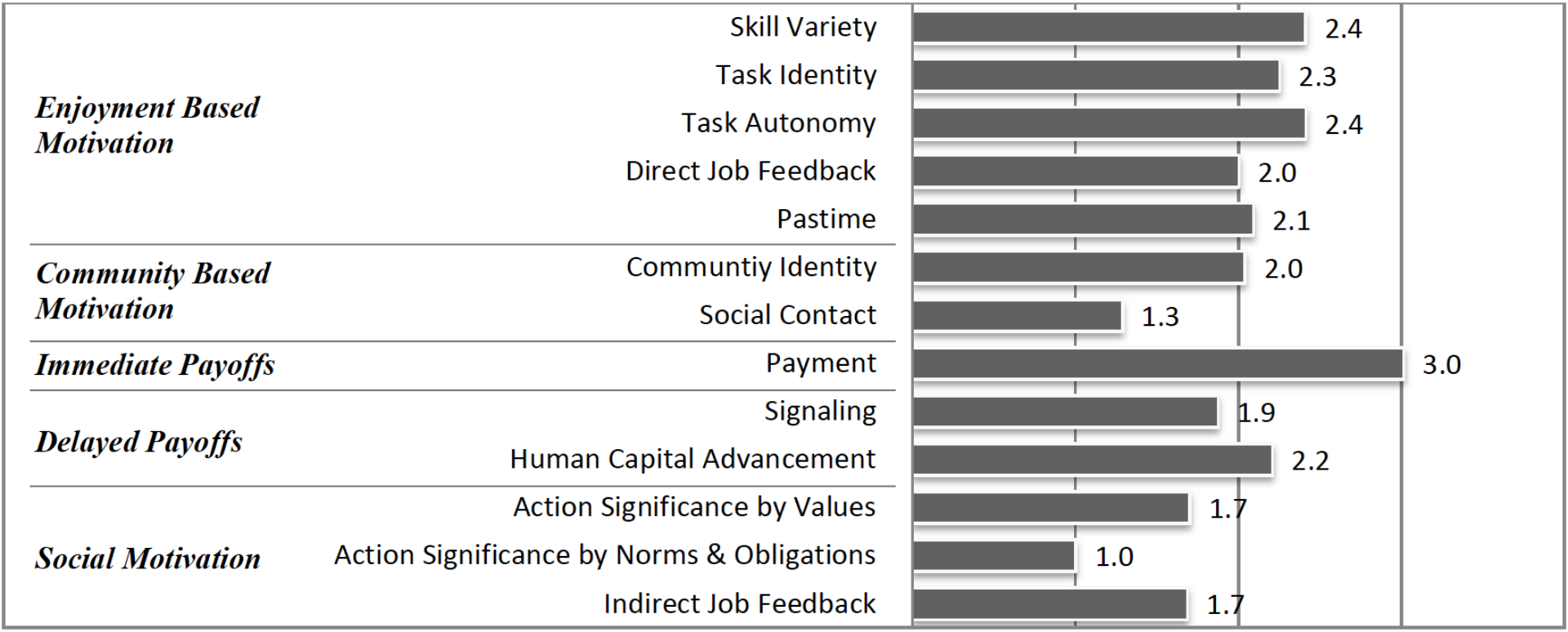
In Motivation Theory and work Motivation Theory

J Hackman and G R Oldham. Motivation through the design of work: Test of a theory. Organizational behavior and human performance, 1976

$$\text{Motivating Potential Score (MPS)} = \left[\frac{\text{Skill Variety} + \text{Task Identity} + \text{Task Significance}}{3}\right] \times \text{Autonomy} \times \text{Feedback}$$

Job Dimensions Model for Crowdsourcing

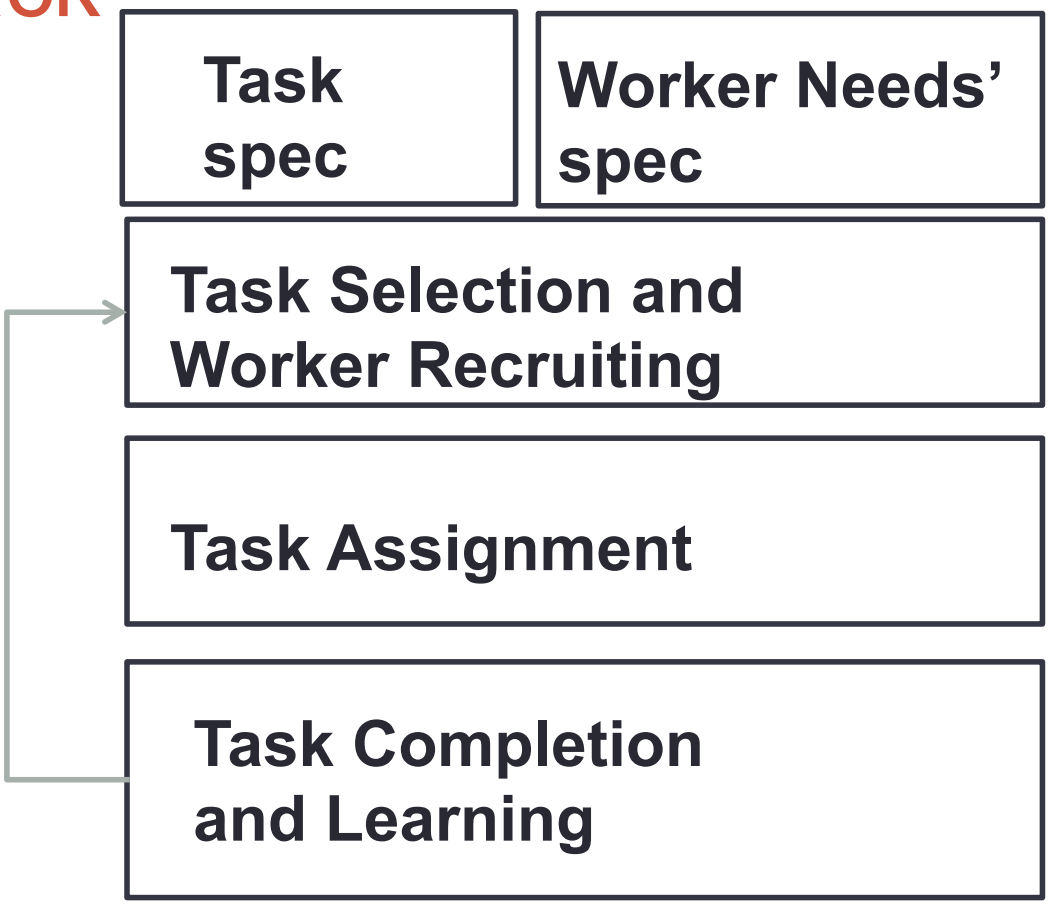
N Kaufmann, T Schulze, and D Veit. More than fun and money. worker motivation in crowdsourcing-a study on mechanical turk, AMCIS, 2011



This talk's point

- Point out the disconnect between how computer scientists and social scientists perceive humans at work.
- Work motivation theory understands *human factors* related to different aspects of work.
- See that there is an opportunity to rethink task assignment and task completion algorithms.
  - Strategies to help a worker find tasks according to her motivation (with Vincent Leroy)
  - Adaptive task assignment that accounts for workers' motivation (with Julien Pilourdault)

Our stack



foulefactory

amazon mechanical turk
Artificial Artificial Intelligence
beta

CrowdFlower

Crowd4U