

Expert Crowdsourcing with Flash Teams

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Warm up Discussion

We have been talked about and experienced crowdsourcing on micro-tasks.

What kind of non-trivial, real-world tasks or part of tasks can be completed by crowdsourcing?

What kind of qualities you would expect to see from Tuckers doing those complex tasks?

We have been doing that!

- Wikipedia
- Real-time substitutes
- Typo finders
- Translations

However, we use a lot of human resources to do what a single expert can do, so why not just use experts?

Crowdsourcing with experts

Why experts not turkers?

What we could do when we can bring experts together?

- complex and independent tasks
- quickly and reliably
- we need a general approach and platform to support tasks

Organizational behavior----obstacles

- What if accident happens?
 - Changing team membership
- What happened when Lex Luthor brought Batman and Superman together in BVS?
 - Disgreement
- What happened to us students when Covid-19 comes?
 - Zoom college, time zone difference,

Again, we need a general approach and platform to build a shared understanding and effective communication.

What do we want?

- Quickly understand their shared work.
 - What am I going to accomplish?
- Interdependencies
 - How is one task related to others?
- Respective roles in completing work
 - What should I do?
- Flexibility
 - What if someone leaves the team?

Intro to *Flash* teams

Definition: Computationally-guided teams with crowd experts

- Lightweight, reproducible and scalable team structures
- Process visualization
- Linked set of modular tasks with intermediate results

https://www.youtube.com/watch?v=lxNvCoLhei0&feature=emb_logo

Flash team composition

- Rome was not built in a day, so we need
- blocks
 - Tasks with experts
 - input-output with tags
 - connected to other blocks
 - self-contained for reuse
 - distributed leadership
 - Directly responsible individual(DRI)



Figure 2: The basic unit of a flash team is a *block*, which gathers one or more paid experts from the crowd to perform a focused task. Blocks can be connected via shared inputs and outputs.

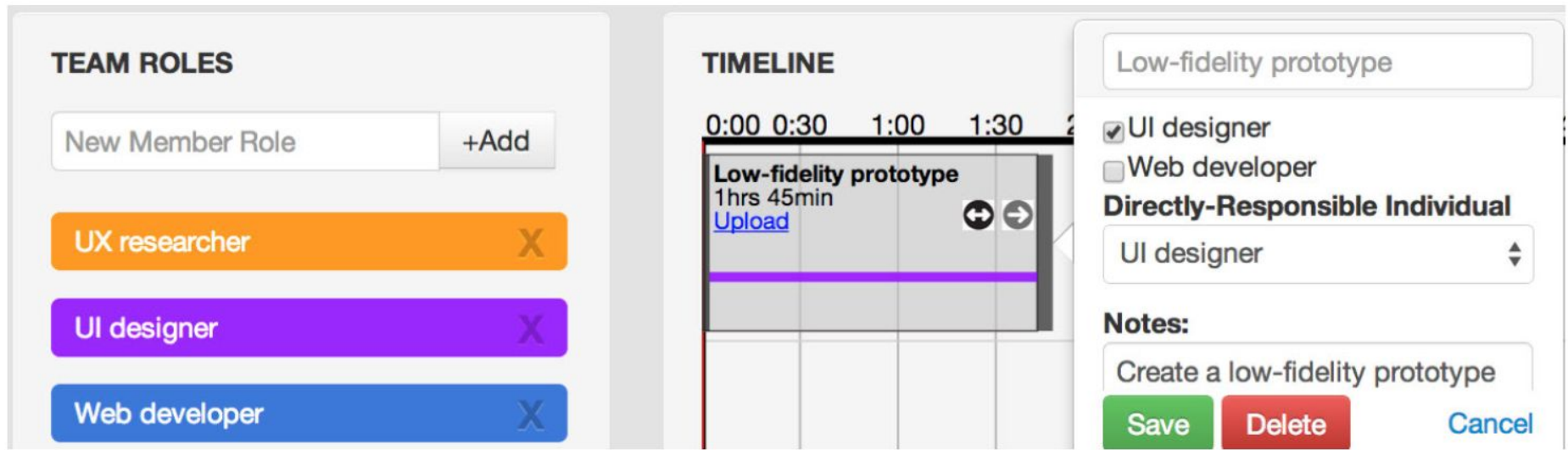


Figure 3: Foundry allows end users to author and manage flash teams. In authoring mode, the user can specify the expertise for each block and enter details about each block's requirements.

Foundry is a flashteam authoring environment and a runtime management platform.

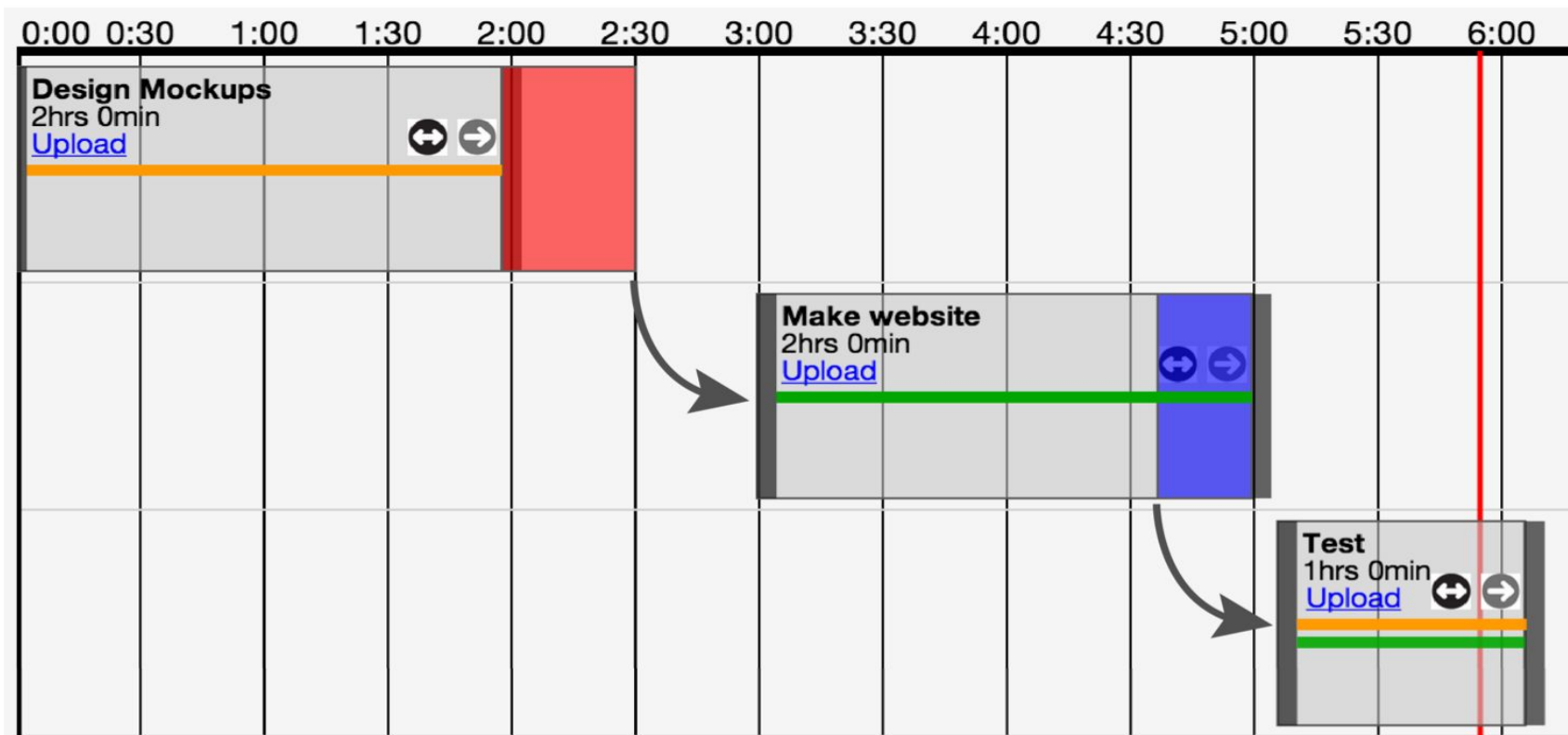


Figure 4: Foundry’s runtime mode: the design mockups finished 30 minutes late but implementation finished early. The current user test block, marked by a red playhead, involves both (orange and green) experts.

Q&A

Runtime and coordination

- Build a team from scratch/borrow an existing team
- Recruit team members(workers) from other market place(oDesk)
- Recruit them in 15 minutes, talents are out there,waiting for work
- **START!**

Requesters

- Monitor process, provide feedback, communicate through chat
- Finishing early/late? Recalculate time, inform worker, **START again**

Computationally-enhanced flash teams

React, optimize and author flash teams on demand.

- modular combination of teams
- Path search support for team authoring
 - Beginners?
 - No problem, all you need is input and desired description of output
- Elasticity
 - grow and shrink on demand
- Pipelining
 - accelerate completion times
- Larger organization

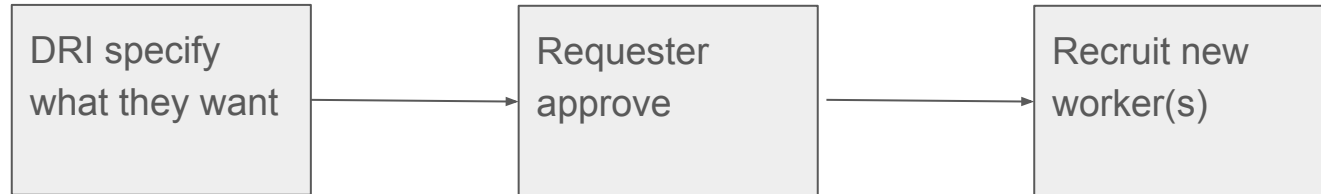
Path search support for team authoring

- Beginners?
 - No problem,
 - All you need is input and desired description of output
 - Example:
 - Input(character sketch) & desired output(3d model)
 - Blocks, Experts teams and Workflow path



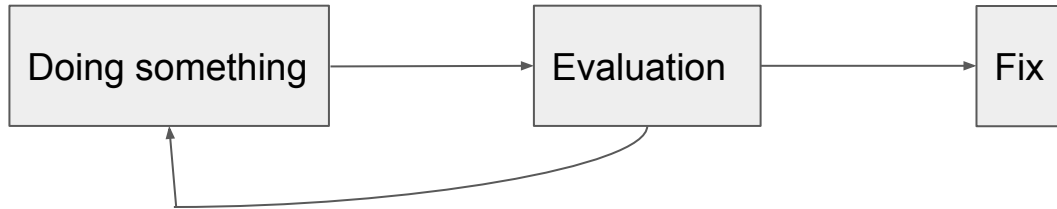
Elasticity

- Need additional help? New skills?
 - No problem!
 - Grow and shrink on demand
 - Quick recruitment. Remember? Within 15 minutes
 - DRI(Direct Responsible Individual) specify what they want



Evaluation and feedback

- No need to wait until one task/module/block is completed
 - Pipelining
 - Less waiting Increased collaboration
 - Unit test

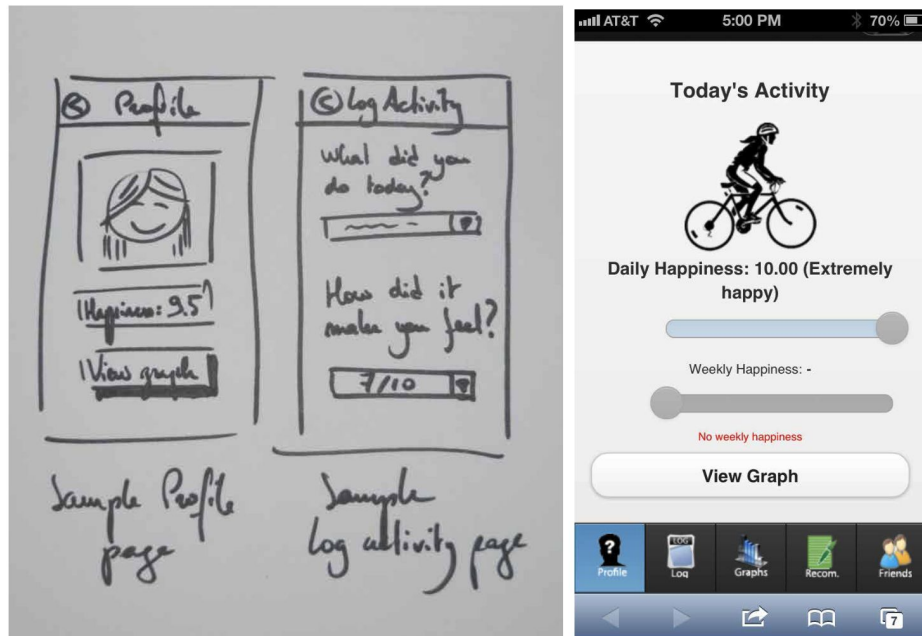


Discussion

- Imagine you are the Requester this time. What kind of complex tasks would you like to have the flash teams to work on? How would you decompose the tasks?
- As a Requester, can you think of several advantages and/or disadvantages of expert crowdsourcing complex tasks to flash teams compared to the traditional organizational recruitment?

Example Flash Teams

- Napkin Sketch Design Team
- Roles
 - UX, UI, Developer
 - 31.5 hours
 - 26.85 dollars per hour
 - total 744.48 dollars



(a) Happily, an emotion-tracking site.

Roles:

- UX, UI, 3 Developers

Time:

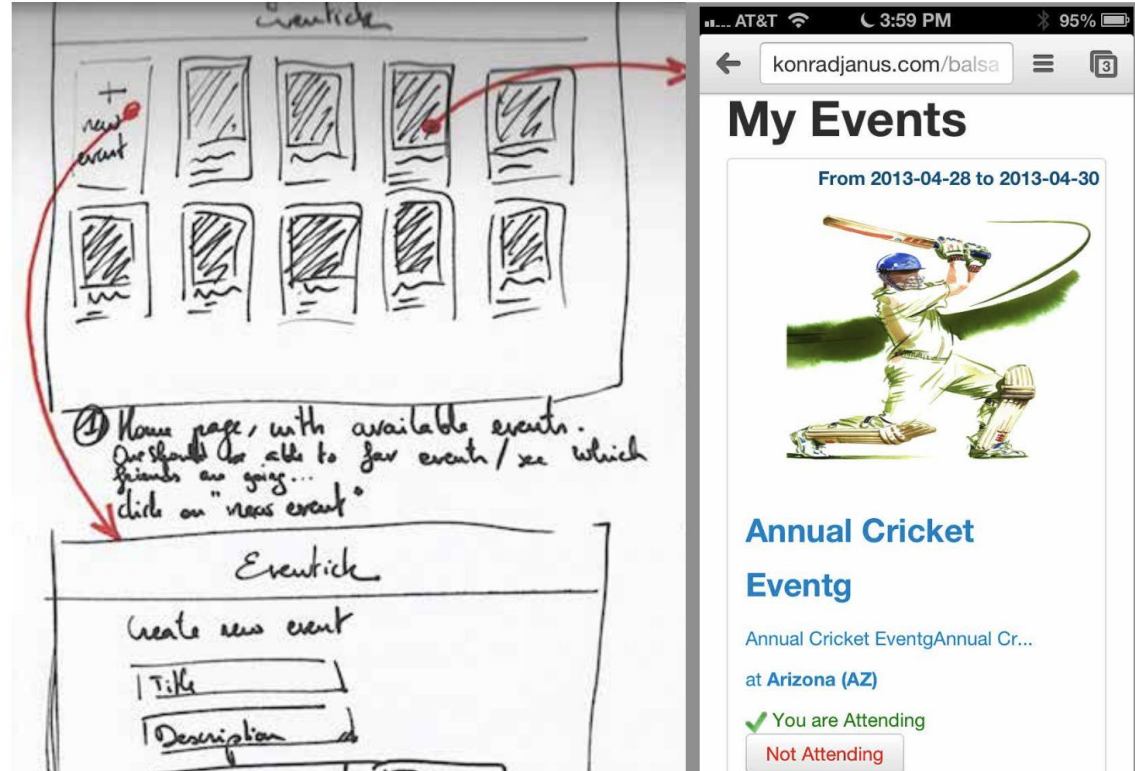
- 18 hours

Median Wage:

- 28.78 dollar per hour

Total cost:

- 1270.28 dollars



(b) Eventick, a local event billboard site.

Roles:

- 2 UXs ,UI,2 Developers

Time:

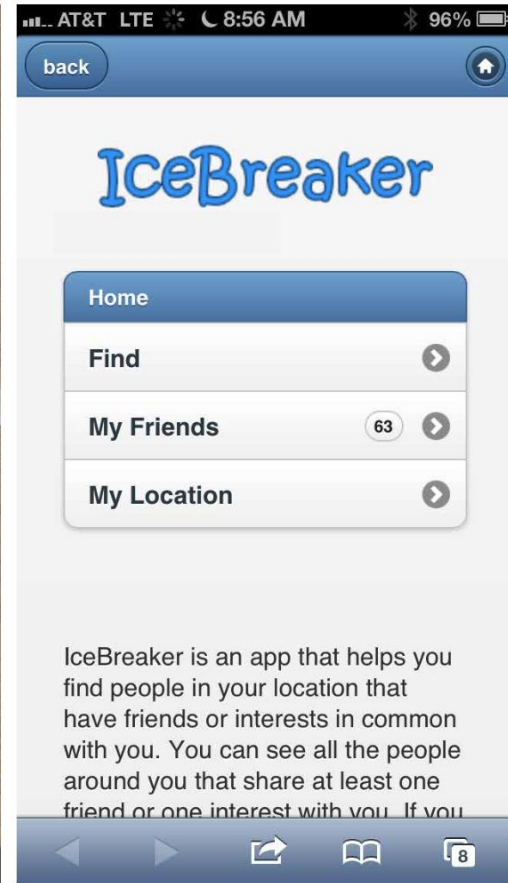
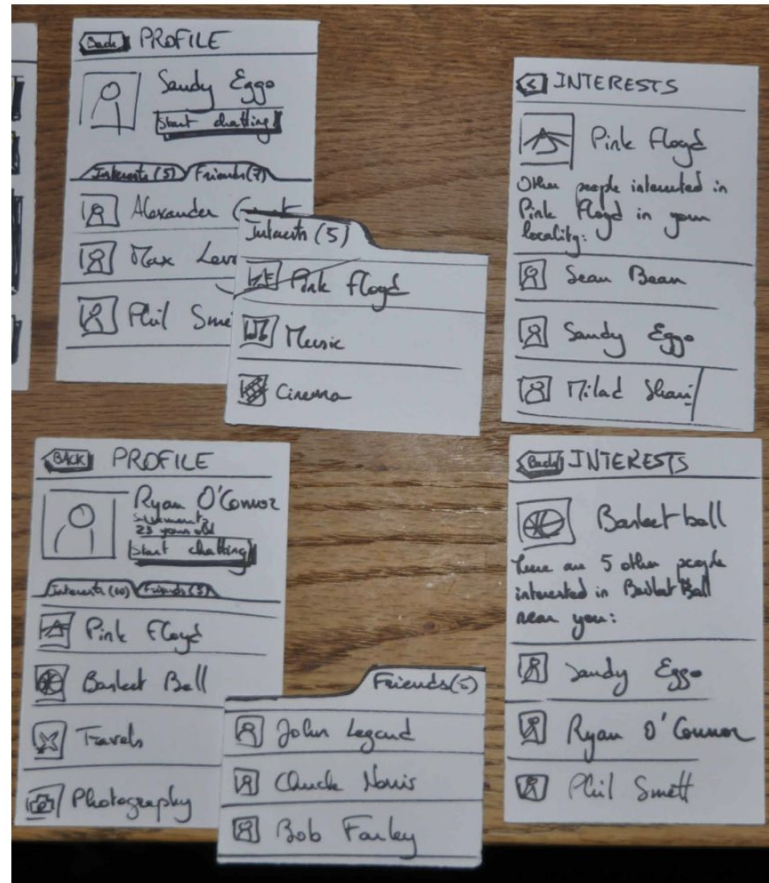
- 23 hours

Median Wage:

- 31.38 dollar per hour

Total cost:

- 1200.97 dollars



(c) Icebreaker: a local social network site.

Animation team

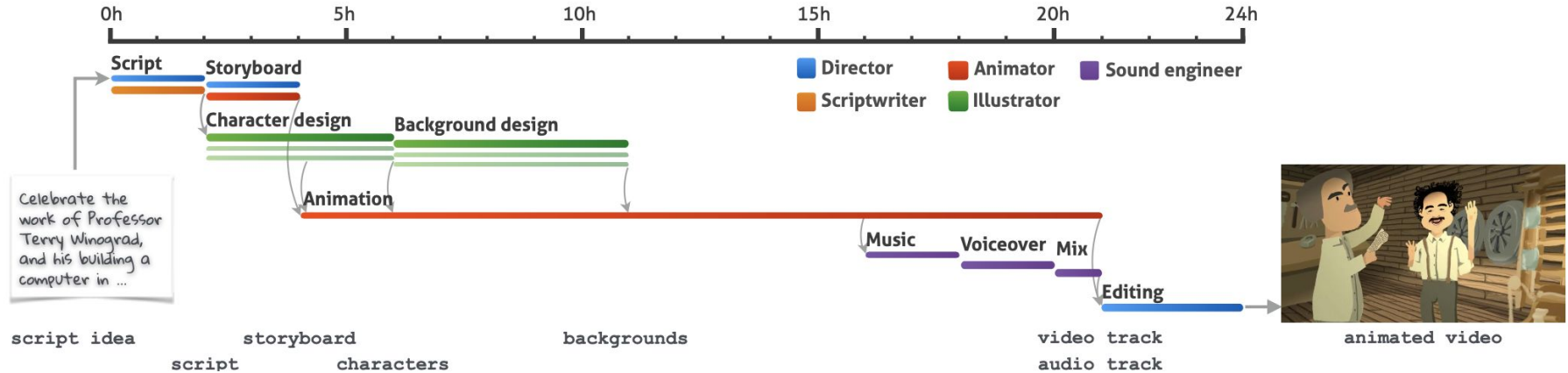


Figure 6: The workflow for the animation flash team, which takes a high-level script outline as input and produces a short animated movie as output.

Composite team: online course platform

1. Task: design homepage for site
 - Task: design homepage for site
 - Input: Napkin sketch
 - Output: high-fi prototype (homepage) A N D design language.
 - Roles: Napkin sketch team
 - Target time: 12hr. Can pipeline output (design language).
2. Design the page to display a course
 - Input: design language A N D napkin sketch
 - Output: high-fi prototype (course).
 - Roles: napkin sketch team
 - Target time: 12hr. Can pipeline input (design language)
3. Write a script and quiz for the video(*Course content.*)
 - Input: lesson idea.
 - Output: multimedia-edited script.
 - Roles: education team
 - Target time: 4hr.
4. Produce the video for the lesson
 - Input: multimedia-edited script.
 - Output: animation.
 - Roles: animation team.
 - Target time: 16hr.

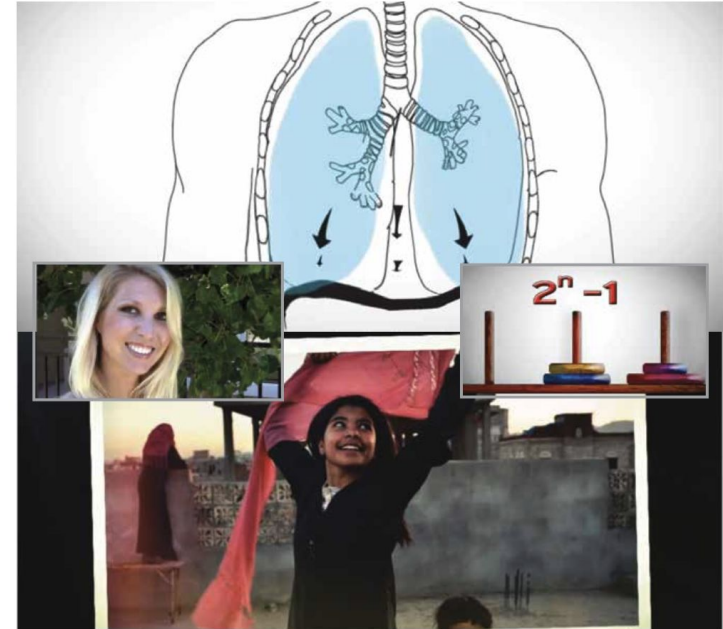


Figure 8: Course videos: singing from the diagram (top), portrait photography (left and bottom), and the Towers of Hanoi puzzle (right).

Field experiment

flash team vs. control group

- Similarity
 - high quality workers
 - Task: mobile web app
- Difference
 - flash team work flow
 - team member's path
 - notification for coordination
 - control team work flow
 - one long task

Results of the field experiments

- Both completed above-bar
- flash teams
 - half time
 - slowest flash team was faster than the fastest team in the control group
 - more closely follow the iterative design process
 - less coordinations
 - replacement
- control group
 - busy waiting
 - decompose tasks inefficiently
 - not many iterations
 - wrong sequence

Condition	Roles	Work Time [hh:mm]	Wall Clock [hh:mm]	Median Wage	Total Cost
Flash	UI, UX1, UX2, Dev	11:02	17:16	\$18.00	\$211.78
Flash	UI, UX, Dev	13:52	24:10	\$22.22	\$364.80
Flash	UI1, UI2, UX1, UX2, Dev	14:13	23:51	\$14.45	\$215.58
Control	UI, UX, Dev1, Dev2	14:30	37:03	\$25.00	\$322.22
Control	UI, UX, Dev	29:20	12:24	\$16.67	\$612.79
Control	UI, UX, Dev	27:30	37:01	\$12.00	\$430.59

Table 2: Time and cost comparison for the flash and control teams. On average, flash teams took half as many work hours than control teams.

Role	Flash Team [<i>hh:mm</i>]	Control Team [<i>hh:mm</i>]
UI Design	2:59 ($\sigma=0:55$)	7:20 ($\sigma=3:39$)
UX Research	3:42 ($\sigma=0:33$)	7:07 ($\sigma=2:52$)
Development	6:21 ($\sigma=0:46$)	9:20 ($\sigma=2:01$)
Total	13:02 ($\sigma=1:45$)	23:47 ($\sigma=8:05$)

Table 3: Average work time by role for the flash and control teams. The flash teams finished the tasks for each role faster than the control teams.

Pro & Cons

advantages:

- crowdsourcing recruitment
- coordination of on-demand expertise
- high quality participants
- modular teams, fluid boundaries

concerns:

- more committed as a team, motivation
- normal traditional teams' problem: coordination and conflict
- immutable workflows

Scale?

- Other type of tasks besides napkin sketch design?
- Complex, open-ended goals
- Teams of larger sizes

Flash Organizations: Crowdsourcing Complex Work By Structuring Crowds As Organizations

- Flash organizations vs. flash teams: further advance
- Organizational structure rather than assembly line
- Centralized hierarchy, flexible and de-individualized coordination
- Open-ended adaption, dynamic recruitment
- Focus more on goals that could not be fully decomposed

Contributions

- The **structure and coordination techniques** of traditional organizations to enable open-ended and complex work
- The **scale and computational management abilities** of crowdsourcing.

The image displays four screenshots of a crowdsourcing platform interface, illustrating its structure and coordination techniques.

Timeline: A Gantt chart showing the progress of a project titled "QUESTION AND ANSWER WEB APPLICATION". The timeline includes tasks such as "HOMEPAGE & LOGIN WIREFRAMES" (2 HRS 30 MIN), "NEWS FEED WIREFRAMES" (2 HRS 30 MIN), "QUESTION & ANSWER WIREFRAMES" (2 HRS 30 MIN), "USER PROFILE WIREFRAMES" (2 HRS 30 MIN), "DESIGN LOGO" (2 HRS), "Q&A DATABASE" (2 HRS), and "USER DATABASE" (2 HRS). The project is in progress, and the team roles listed are UI Designer - Platform, UI Designer - Q&A, UI Designer - Users, Graphic Designer, and Backend Developer - Q&A.

Task Details: A detailed view of the "Homepage & Login Wireframes" task. The task status is "not started" with a duration of 2:30. The goal is to create wireframes for the homepage and login pages using Balsamiq. The deliverables are homepage wireframes and login wireframes. The task is available for hire, with options to edit or delete the task.

On-Demand Hiring: A screenshot of the "FOUNDRY HIRING PORTAL" showing a task available for hire. The task is "Homepage & Login Wireframes" with a duration of 2 HRS 30 MIN. The position in the queue is No. 1, and the deadline to accept the position is 10 minutes. The user can accept or decline the position.

Onboarding: A screenshot of the "Your Task" onboarding screen. It provides instructions on how to start the task, including clicking on the task rectangle and clicking start to read about the task and start tracking work time. It also mentions that time for reviewing previous materials, etc. are accounted for as work time. The task is "USER PROFILE WIREFRAMES" with a duration of 3 HRS 45 MIN.

The idea of flash organizations

- Computational organizational structures
- Reconfigurable organizational structures
- On-demand hiring of expert crowd workers

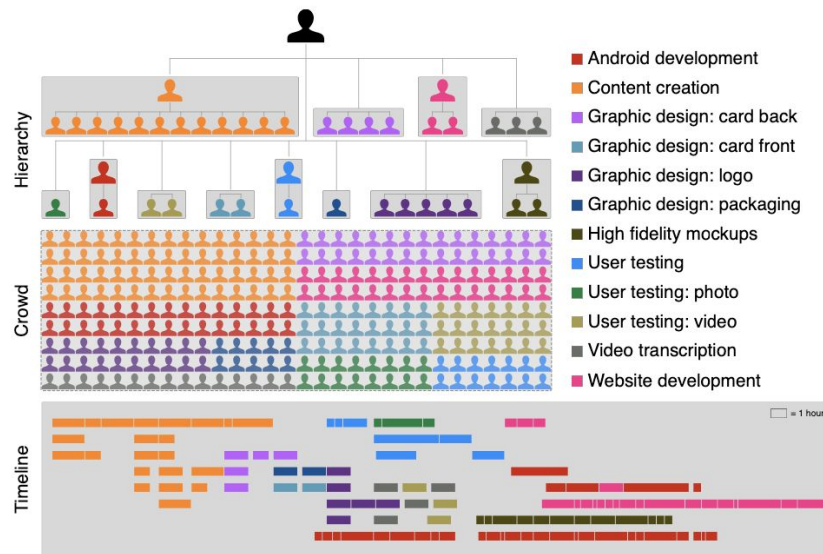


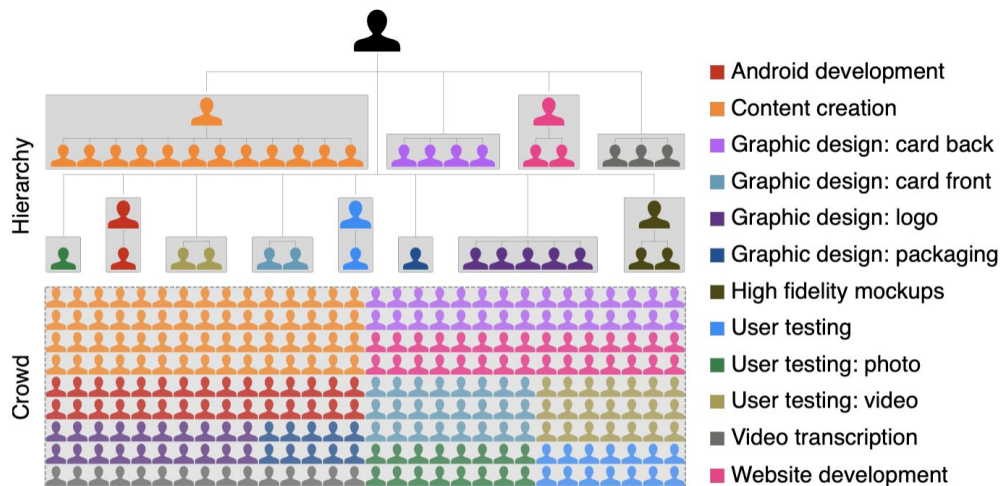
Figure 1: Flash organizations are crowds computationally structured like organizations. They enable automated hiring of expert crowd workers into role structures, and continuous reconfiguration of those structures to direct the crowd's activities toward complex goals.

Computational organizational structures

- *Asset Specificity*
 - Workers become more and more in sync with teammates over time and improve their ability to coordinate and solve problems with a specific group of people.
 - Crowdsourced experts have never worked together before.
- Learn from temporary organizations
 - disaster response teams, movie crews
- **Solution: Role Structures**
 - Rely on knowledge of their roles rather than knowledge of other workers

Role structures

- Expertise specific
- Arranging roles into a centralized hierarchy
- Leaders are responsible for reviewing workers' submission.



Reconfigurable organizational structures

- Organizational structures need to be modified often to enable dynamic adaptation
- **Problem: send structure updates to distributed workers in real-time**
 - Possible solutions:
 - Google Docs?
 - Wiki?
 - **Git version controls**

Reconfigurable organizational structures

- Branch
- Merge
- Pull requests
- Conflicts
- Diff algorithms

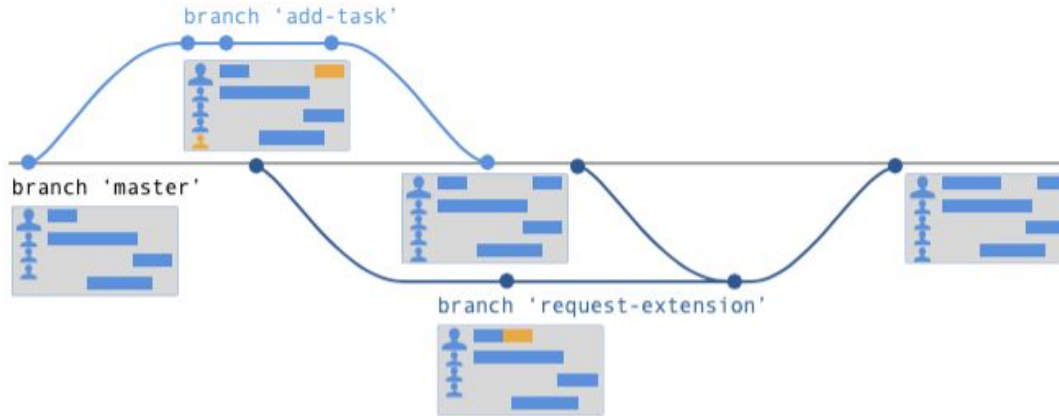


Figure 3: Workers can branch the current organizational structures, make any desired edits, and then issue a pull request for review. This mechanism enables the organization to continuously adapt.

On-demand hiring of expert crowd workers

- Populates the structure with on-demand hiring
- Hire experts from crowdsourcing marketplaces such as Upwork based on skill qualification
- Dynamically add the new role into the organizational structure
- First-come, first-served hiring queue
- Quick onboarding by orienting new workers to their role responsibilities and positions
- ~15 mins on average

Evaluating performance through real examples

EMS Trauma Report



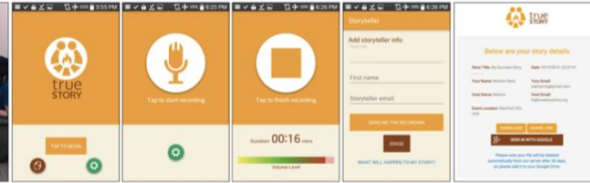
Android Application & Website



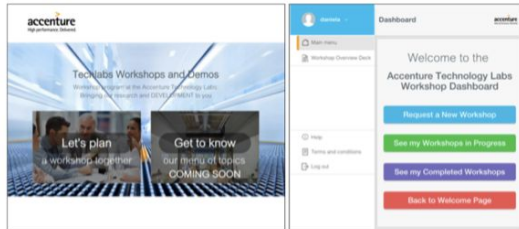
True Story



Card Game, Android Application & Website



Enterprise Workshop Planning Portal



Web Application

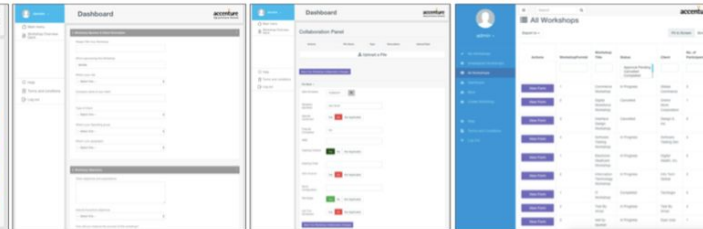


Figure 4: Three flash organizations successfully developed:(top) a tablet application and web portal for emergency medical responders; (middle) art, content, and a supporting application for a storytelling card game; and (bottom) an enterprise IT portal for consultant workshop planning.

Results

	Median hiring time	Pull requests	Leaders	Team leads	Workers
EMS Report	13min40s	335	7.2%	92.8%	0.0%
True Story	12min30s	113	21.2%	47.8%	31.0%
Enterprise	15min13s	118	66.9%	17.9%	15.3%

Table 2: Automated hiring and organizational reconfigurations.

- Complete within **6** weeks
- Convencing workers on-demand in **14** minutes on average
- **93** crowd workers, **22** team leads, **24** teams
- **639** tasks, **3,261** person-hours of work time
- **52,000** lines of code
- **2 mobile applications, 3 full-stack web applications**
- Each organization successfully completed its goal to the satisfaction of the leader and received an acceptable quality rating by the three expert reviewers.

Results

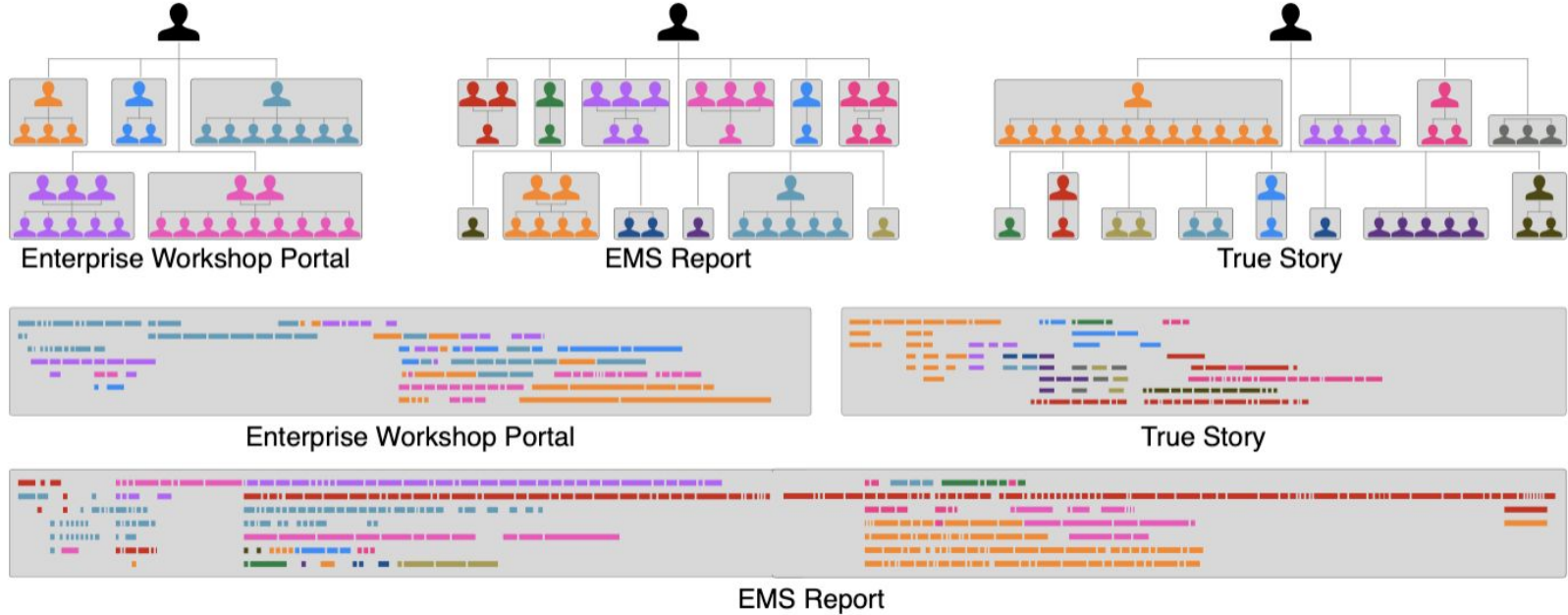


Figure 5: Final organizational structures (top) and completed timelines (bottom) for the three flash organizations. Colors indicate different roles and corresponding tasks (details in Appendix). Structures varied from flat to nested hierarchies, and included 24 teams and 639 tasks across 3,261 person-hours of work time.

Last Discussion

- What are some defects that you see in flash organizations? Can you try to come up with some possible solutions to improve the situation?
 - Strangers are not as effective as familiar teams
 - Noisy hiring process due to crowdsourcing recruiting platforms' over-inflated reputation systems
 - ...

Resources

[Expert Crowdsourcing with Flash Teams](#). Retelny et al. UIST 2014

[Flash Organizations: Crowdsourcing Complex Work by Structuring Crowds As Organization](#). Valentine et al. CHI 2017.

Expert Crowdsourcing with Flash Teams https://www.youtube.com/watch?v=IxNvCoLhei0&feature=emb_logo