

DISCUSSION

In our analysis of on-demand work via the piecework lens, three issues arose: 1) the hazards of predicting the future, 2) utopian and dystopian visions, and 3) a research agenda. We will attempt to grapple with these questions here explicitly.

The Hazards of Predicting the Future

The past can't be a perfect predictor for the future; as Scholz points out, "it would be wrong to conclude that in the realm of digital labor there is nothing new under the sun" [24]. Our analysis is limited by the differences, foreseen and unforeseen, between historical piecework and modern on-demand work. For example, many of the challenges that *Dynamo* overcame in crowd collective action, such as designing for trustworthiness and ensuring anonymity, were relatively unique challenges precipitated by the affordances of the internet. For example, unlike physical work environments, people can (and often do) contribute to online communities in a one-off manner [19]. The internet makes this kind of loose affiliation feasible. While we have attempted to understand the likely overlaps and differences between history and modern day, no analysis is perfect.

But this does not mean that attempting to draw meaningfully from historical scholarship would be folly; enough of piecework can and does inform on-demand work that HCI and CSCW might seek out historical framings for other phenomena of study as well. While we can only speculate one of (perhaps many) possible futures, history does allow us to articulate and bound which futures appear more likely.

In particular, the predictions that have emerged surrounding crowd work have run the spectrum from deep pessimism [11] to exuberant optimism [15]. In the next section, we will use the piecework foundation which informed our case studies to trace out possible dystopian and utopian futures for on-demand labor.

Utopian and Dystopian Visions

An easy narrative is to characterize the future of on-demand labor at one of two extremes. On one hand, crowd work researchers imagine the application of crowdsourcing as a potentially bright future that enables the achievement of near-impossible goals and career opportunities [26, 15, 6, 25]. On the other hand, researchers warn that on-demand labor will create exploitative sites of dispossession [24], racial discrimination [10], and invisible, deeply frustrated workers [13, 7].

A uniquely challenging facet of this topic of inquiry is the public attention that this domain has attracted. Activists have described speculative work as having "essentially been turned into modern-day slaves" [4]. Meanwhile, advocates describe it as "a project of sharing aimed at providing ordinary people with more economic opportunities and improving their lives" [9].

Piecework teaches us that, without appropriate norms and policy, the dystopian outcome has happened and will happen again. The piecework nature of on-demand work induces us "to neglect tasks that are less easy to measure" [2], rewarding us not for creativity but predictability; payment for this work

may ultimately be determined by an algorithm that fundamentally doesn't understand people; the layers between us and our managers might increasingly become "defective (simple, observable)" algorithms [3], just like those which already frustrate on-demand workers [17, 23, 13]. However, social policy has advanced since the early 1900s, so as on-demand work gains popularity a repeat of *How the Other Half Lives* [21] seems less likely.

On the other hand, while piecework's nascent years were grim, they precipitated a century of extremely strong labor advocacy [12, 18]. Even today, the Geist that came out of the labor union revolution inspires collective action and worker empowerment around the world: in India, workers across the nation recently engaged in the largest labor strike in human history — perhaps as many as 150 million [1]. If labor advocacy groups can find ways to permeate on-demand labor markets as some have called for [14], then the future of on-demand labor may follow the same trajectory of worker empowerment that piecework later found.

The history of piecework suggests that the utopian and dystopian outcomes will both occur, in different parts of the world and to different people. When piecework plummeted in the United States, outsourcing rose — creating major labor issues around the world. It is entirely possible that we will create a new brand of flexible online career in developed countries, while simultaneously fueling an unskilled decentralized labor force in developing nations. As designers and researchers, this prompts the question: which outcome are we attempting to promote or avoid for who?

A Research Agenda

Piecework also helps bring into focus the areas of research that might bear the most fruit. We return to the three questions that motivated this paper: 1) "what are the complexity limits of on-demand work?" 2) "how far can work be decomposed into smaller microtasks?" and 3) "what will work and the place of work look like for workers?"

While we have arguably outpaced piecework with regard to the limits on the complexity of work, the most complex and open-ended wicked problems [22] remain the domain of older human collectives such as governments and organizations. In addition, we can learn from the piecework literature as it relates to the stymieing effect that mismanagement has on workers; research into the complexity limits should emphasize on finding new ways to manage workers, in particular using humans — perhaps other crowd workers — to act as modern foremen.

Piecework researchers looking into decomposition pointed out long ago that piecework is saddled by a lower limit on decomposition: "piecework does not compensate workers for time spent switching tasks" [5]. We've since studied this phenomenon in crowd work to great length both observationally [8] and experimentally [16]. We should consider whether this remains a worthwhile area to explore; unless the work we put forth directly affects the costs of task-switching — for instance, the cost of suboptimal task search, or the cognitive burden of changing tasks — we may only make incremental

	<i>Observations in piecework</i>	<i>Mechanism</i>	<i>What does this mean?</i>
Complexity	Substantial growth in task complexity by reconstituting large tasks into smaller components. Later, innovations in specialized training enabled expert pieceworkers.	Smaller components could be more easily verified, but this became a limiting factor as well; tasks which are inherently difficult to evaluate are difficult to decompose.	We've already seen a push on complexity; we may be at the tail end of complexity, or we may yet see revolutionary advances in task complexity through recomposition.
Decomposition	Work tasks could be decomposed and measured, but measurement and tracking tools at the time were rudimentary, frustrating workers in myriad industries.	Scientific Management and Taylorism informed and drove decomposition by measuring and facilitating the optimization of smaller and smaller tasks.	The research has reached an "atomic" level of decomposition, exhausting the cognitive limits of the human brain, past which point task-switching becomes a substantial cost.
Relationships	Firms antagonized and exploited workers, leading workers to support one another independently, ultimately resulting in strong advocacy groups counterbalancing firms.	The features of piecework (independence and transience) were both the fulcrum managers used to exploit workers as well as the focal point around which workers bonded.	On-demand workers will recognize a common pattern of exploitation, coordinate their collective power to form worker advocacy groups.

Table 1. First pass at a summary table of findings. Note that all of the cells have the same number of lines. Pretty neat, huh?

advances in micro-task decomposition. When the cognitive cost of understanding a task and its inputs outstrips the effort required to complete the task, decomposition seems a poor choice.

Finally, we turn to the relationships of crowd workers. The crowd work literature here can convincingly speak back to the piecework scholarship perhaps more than in the other sections. The tools that are available to us today — not just technical, but *methodological* — make it possible to discover, study, and partner with crowd workers in ways that were unimaginable to piecework researchers. A professor engages in crowd work [7] not just because it's possible, but because our community appreciates the importance of approaches such as participant-observation and ethnography as a whole [20].

References

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