INTRODUCTION

The past decade has seen a flourishing of *on–demand work*, largely driven by the reformulation of work as constituent parts of larger tasks. This framing of work into modular blocks has enabled the computational hiring & management of workers at scale [12, 2, 17]. Distributed paid participants then engage in work whenever their schedules allow, with little to no awareness of the broader context of the work, and often with fleeting identities and associations [23, 21]. In this paper, we use the term on–demand work to join a pair of related phenomena: first, *crowd work*, on platforms such as Amazon Mechanical Turk (AMT) and other sites of (predominantly) information work; and second, *gig work*, often as platforms for one–off jobs, like driving, courier services, or administrative support. The realization that complex goals can be accomplished by directing and managing crowds of workers spurred industry to flock to sites of labor like AMT to explore the limits of this distributed, on–demand workforce. Researchers have also taken to the space in earnest, developing systems and designs that enable new forms of production [e.g. 1, 3, 27].

As on–demand work has grown far beyond information work, it has given rise to an increasingly complex, conflicted culture amongst both the workers who enable it and the researchers who study it. Howe first described crowdsourcing broadly as "outsourcing to an undefined, generally large group of people in the form of an open call" [12]. However, for years its instantiation was limited to the utilization of human intelligence to process data, participate in scientific studies, and perform information work [16, 36, 39, 8, 28]. More recently, crowdsourcing of physically embodied work — driving and cleaning, for instance — has become a focus for on–demand labor markets [21, 35, 11, 34]. This growth prompted efforts to understand not just the work, but also the workers on these platforms [30, 32]. Some of this research has been motivated by the identification of the sociality of gig work, and the frustration and disenfranchisement that these systems embody [14, 23, 24]. Other work has focused on the outcomes of this frustration, reflecting on the resistance workers express against digitally mediated labor markets [21, 31].

This body of research has broadly sought to answer one central question: What does the future hold for on–demand work and those who do it? Researchers have offered insights on this question along three major threads. First, **??**? Specifically, (a) How complex are the goals that crowd work can accomplish?, and (b) What kinds of goals and industries may eventually utilize it? [29, 33, 15, 38, 37, 25, 10]. Second, **??** [18, 1, 6, 22, 19, 20, 5, 7, 26]. And Third, **??**? [14, 13, 31, 9, 4, 24].

This research has largely sought to answer these questions by examining extant on–demand work phenomena. So far, it has not offered a framing for holistically explaining the developments in worker processes that researchers have developed, or the emergent phenomena in social environments; nor has any research gone so far as to directly predict future developments.

Piecework as a lens to understand crowdsourcing

In this paper, we offer a framing for on–demand work as a contemporary instantiation of *piecework*: a work and payment structure which breaks tasks down into standalone contracts, wherein payment is made for work output, rather than for time. Piecework as a metaphor for crowd work is not new. Indeed, Kittur et al. in 2013 referenced crowd work as piecework briefly as a loose analogy to the form of work emerging at the time [17]. But more than this, the framing of on–demand labor as a re–instantiation of piecework gives us years of historical material to make sense of this new form of work, and allows us to reflect on–demand work through a mature theoretical lens, informed by decades of rigorous, empirically based research.

More concretely, by looking at on–demand work as an instantiation (or even a continuation) of piecework, and by looking for patterns that the corresponding literature predicts on this basis, we can: first, make sense of past events as part of a much larger series of an interrelated phenomenon; second, reflect on differences in the factors that impacted piecework historically and impact on–demand work today; and third, to some extent, offer predictions of what on–demand work researchers, and workers themselves, might expect to see on the horizon. For example, we will draw on the piecework literature studying task decomposition, which was historically limited by technological limits in measurement and instrumentation, and leverage that understanding to suggest how modern technology affects this mechanism in on–demand work.

We organize this paper as follows: we first review the definition and historical arc of piecework to lay groundwork and make clear the analogy to on–demand work (which we will refer to as *crowd work* subsequently, for consistency with prior literature). Then, we interrogate the three major research questions above using the lens of piecework. We will identify similarities and differences between piecework as historically understood and on–demand work as we experience it today. Finally, we will make predictions of future developments based on how those similarities and differences influenced piecework. Finally, we will offer implications for researchers and practitioners based on our results.

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