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Why Individuals Participate in Micro-task Crowdsourcing Work Environment: Revealing Crowdworkers' Perceptions

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Abstract:

Advancements in Internet and digital technologies have enabled a new work form of open sourcing, which we refer to as the crowdsourcing work environment (CSWE). This new form of work has the potential to disrupt and transform the nature of traditional work. However, our understanding of this new work form is still in its incipient stage. To enhance our understanding, this study captures crowdworkers' perceptions to explore the characteristics of the crowdworkers, crowdsourcing jobs, and the crowdwork environment that collectively drive the crowdworkers to participate in open source work. Guided by the job characteristic theory and work value perspectives, we used the revealed causal mapping method to analyze narratives by 55 crowdworkers registered on Amazon Mechanical Turk (MTurk). Our data analysis uncovered nine main constructs, 22 key concepts, and 815 causal-effect linkages surrounding CSWE that could guide our theoretical understanding of this emerging phenomenon. Individual needs and the crowdwork context emerged as the major factors motivating individuals' initial participation in CSWE, but we found crowdsourcing task characteristics (e.g., job autonomy, task variety, task significance, task instruction, and task compensation) and a digitally enabled environment (e.g., system affordance and MTurk governance) to shape crowdworkers' continued participation in CSWE. The findings suggest several promising research streams, including the psychological factors (i.e., personal growth needs and work values) and social outcomes (i.e., empowerment or exploitation of crowdworkers) for examining the psychology and sociology of crowdsourcing work.

Keywords: Crowdsourcing, Digitally Enabled Environment, Crowdwork, Crowdworker, Job Characteristic, Open Sourcing, Work Value, Revealed Causal Mapping, Amazon Mechanical Turk.

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1 Introduction

Rapid advancements in information technologies (IT) such as pervasive computing and digital technologies[1] have affected many facets of people's work and life in today's society. Enabled by these technologies, crowdsourcing (CS) has emerged as a new work form to harness the collective wisdom of the public and to tap into the large-scale, on-demand virtual labor force (Howe, 2006). We refer to the new work form of open sourcing enabled by digital technologies as the crowdsourcing work environment (CSWE). Our study focuses on the micro-task CSWE in which organizations publish small human computing tasks on a third party online platform on a mass scale to benefit from a flexible, on-demand virtual workforce. Examples of micro-task CSWE include Amazon Mechanical Turk (MTurk) and CrowdFlower. Micro-task crowdsourcing is growing rapidly and attracting participation from both demand and supply sides (Bratvold, 2011). We premise that this new digitally enabled and mediated CS work form has the *potential* to transform the traditional nature of work.

However, our understanding of this work environment's nature and workforce is in its incipient stage. As Kittur et al. (2013, p. 10) point out, "Crowd workers are a diverse and multifaceted population with a range of motives and experience. Yet few researchers have grappled with the diversity and richness of the motives of the individuals comprising the crowd". Both industry and academia have expressed concerns about the common practice of low payment for micro-task CS. For example, the average U.S. crowdworker earned US$2.30 per hour—not even close to the minimum hourly wage in the US—according to a survey of 400,000 registered workers on MTurk in 2009 (Ross, Irani, Silberman, Zaldivar, & Tomlinson, 2010). Individuals' increasing participation in this form of work is perplexing given the extremely low pay scale coupled with the fact that workers in micro-task crowdsourcing mostly work independently with minimal or no social interaction. This puzzling behavior is difficult to explain through the lens of the traditional job design and motivation literature because the very nature of work is changing (e.g., digitization of work, boundary-less work). The popularity of the micro-task CS, despite the seemingly unattractive work in this environment, has motivated us to explore this IT-enabled work phenomenon. In this study, we capture crowdworkers' perceptions to answer the following research questions:

RQ1: Why do individuals participate in micro-task CSWE?

RQ2: What are the characteristics of the crowdworker, crowdwork, and its environment that collectively drive individuals to participate in micro-task CSWE?

To our knowledge, the answers to these questions are not yet readily available.

To answer the questions, we focus on MTurk, a CSWE in which crowdworkers receive money for successfully completing micro tasks that job requesters post. Theoretically, we inform our study with work design theories (e.g., Hackman & Oldham, 1975, 1976) that premise that one can design organizational work to increase employees' motivation and improve their work performance. Methodologically, we analyze crowdworkers' responses to open-ended questions using revealed causal mapping (RCM) method, a subcategory of cognitive mapping that entails an inductive process of evoking constructs and linkages from the respondents' statements (Narayanan & Armstrong, 2005). Because we investigate how human actors make sense of the digitally enabled and mediated CSWE rather than hypothesize or test cause-and-effect relationships, we believe that the RCM method is appropriate for identifying key constructs and linkages in this complex and emerging phenomenon of micro-task crowdsourcing. Informed by earlier theorizing and by our empirical study, we develop an analytical generalization of the motivational properties of the CSWE.

This paper proceeds as follows: in Section 2, we describe our investigative context. In Section 3, we review micro-task crowdsourcing and work design studies. In Section 4, we detail the RCM method and illustrate how we coded and analyzed the data. In Section 5, we present the results of the key constructs and concepts. In Section 6, we discuss the themes that emerge in the CSWE, highlight the research contributions, and suggest directions for future research. In Section 7, we conclude the paper.

[1] Digital technologies are electronic devices, systems, and resources that generate, store, process, and transmit digitized content such as text, graphics, audio, and video. Examples include the Internet, social media, cloud computing, interoperable systems, and mobile devices.

2 Investigative Context: Micro-task Crowdsourcing Work Environment

Our definition of CSWE comprises four dimensions, including six essential characteristics, four sourcing models (Kaganer, Carmel, Hirschheim, & Olsen, 2013), three payment models (Kaganer et al., 2013), and four work features (See Table 1). A CSWE should have all of the six essential characteristics: on-demand virtual labor, open access to work, Internet access to join the crowd, three stakeholders, human tasks, and modular technical architecture. Depending on the crowdsourcers' sourcing needs, one can classify a CSWE's models as facilitator, aggregator, arbitrator, or governor. Researchers generally classify CSWE's payment methods into three types: financial award, fee for task, and fee for job. Finally, one can characterize the work in a CSWE using the following four features: task granularity, worker selection, work coordination, and work collaboration (or lack thereof).

In this paper, we focus on micro-task crowdsourcing work environment that satisfies all of the six essential characteristics. In this environment, a crowdsourcer broadcasts open calls to the crowd registered on an online digital modular platform to tap into the large-scale, on-demand virtual labor force to complete micro tasks that are difficult to automate (Howe, 2006). Micro-task CSWE employs an aggregator sourcing model to quickly complete large quantities of standardized work by aggregating thousands of micro tasks that multiple crowdsourcees perform on an individual basis (Kaganer et al., 2013). This work environment uses the fee for task payment model in which one completes tasks in exchange for monetary remuneration. The fee for task-based compensation rates (usually pennies per minute) for completed tasks are based on the number of micro tasks completed rather than an hourly wage. For example, MTurk recommends that job requesters pay at least US$0.1 for a one-minute task. Similarly, 98 percent of the micro tasks pay less than US$1 (Hoßfeld et al., 2011).

The relative "microness" of this work environment is most apparent in the nature of the work sourced. The platform modularity allows one to separate and recombine a piece of digitized work at varying levels of granularity. Micro-tasks are decomposed, self-contained, small tasks that are simple to perform repeatedly (Hoßfeld et al., 2011). These simplified tasks are often incremental pieces of a complex task. In many instances, technology can automatically divide and disaggregate a complex task into simplified micro tasks and re-aggregate them into completed tasks automatically, which eliminates the need for a comprehensive review of responses (Chandler, Paolacci, & Mueller, 2013). An individual needs only a limited skillset to complete micro tasks, which simplifies the worker-selection process. The platform either automatically distributes tasks to the crowd (e.g., http://www.microtask.com/) or the members of the crowd select the tasks themselves (e.g. https://www.mturk.com). The coordination between the crowdsourcer and the crowdsourcee is limited or non-existent because of work simplification and platform mediation. As each task can be completed in a short duration (i.e., usually from seconds to minutes), they do not require much collaboration, and one worker with little to no interaction with other workers, requestors, or platform owners can complete it independently and anonymously.

The role of digital technologies is salient to the CSWE's structure because these technologies help shape the conduct of work by not only broadening the access, scope, scale of work and worker, but also by influencing how the work is organized and performed (Orlikowski & Scott, 2015). Specifically, the digital nature of CSWE makes possible the modularity and the granularity properties of digital components embedded in these work environments (Kallinikos, Aaltonen, & Marton, 2013; Yoo, Henfridsson, & Lyytinen, 2010). The flexibility that modular technical architecture provides supports a multitude of sourcing and payment configurations. In addition, accommodating various agencies in these work systems (e.g., workers selecting a task of their choice; requestors hiring workers on demand) is closely tied to the modularity of the platform architecture. The ability to design tasks with a varying degree of granularity, which is integral to disaggregating and re-aggregating work in this environment, also primarily stems from the tasks' digitization.

Table 1. Crowdsourcing Work Environment

Dimension	Definition
Essential characteristics	
On-demand virtual labor	Crowdsourcers can hire workers online as needed (Howe, 2006).
Open access to work	Crowdworkers can join the crowd freely (Howe, 2006).
Internet access to join the crowd	Work is available over the network and can be accessed through heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops, and workstations) (Howe, 2006).
Three stakeholders: crowdsourcer, crowdsourcee, crowdsourcing intermediary	A crowdsourcer (also known as initiator, job requester, or buyer) is an initiating organization or individual that sources specific work to the public for open access (Estellés-Arolas & González-Ladrón-de-Guevara, 2012). A crowdsourcee (also known as crowd, worker, supplier) is an individual from the crowd who performs the crowdsourced work. Together, they make up the on-demand online virtual workforce in crowdsourcing; it's a large, anonymous, and potentially distributed crowd called the "human cloud" (Kaganer et al., 2013). Crowdsourcing intermediary are online platforms providers (e.g., Amazon Mechanical Turk) that act as a mediator between the crowdsourcer and the crowdsourcee.
Human tasks	The crowdsourced work are computation operations in digitized form that are easy for people to perform but difficult for machines (e.g., computer robots) to automate (Kaganer et al., 2013).
Modular technical architecture	The platform design comprises separate components that can be configured together to enact sourcing of human tasks.
Sourcing models (Kaganer et al., 2013).	
Facilitator	A business model connecting suppliers and buyers directly through a bidding process (e.g., Freelancer, Elance, oDesk).
Aggregator	A business model aggregating hundreds or thousands of micro tasks performed by multiple suppliers (e.g., Mechanical Turk, MobileWorks, CrowdFlower).
Arbitrator	A business model engaging multiple suppliers through competitions (e.g., crowdSPRING, InnoCentive, Witmart).
Governor	A business model providing project governance and certifying supplier quality (e.g., TopCoder, Trada, uTest).
Payment methods (Kaganer et al., 2013).	
Financial awards	Buyers establish the pricing, and buyers can choose from multiple competing inputs/deliverables and pay only for the one they find most valuable (e.g., crowdSPRING).
Fee for job	The buyer and supplier (or platform) negotiate the pricing, and the buyers pay the fee for a completed job (e.g., TopCoder).
Fee for task	The buyer, who pays the fee for tasks completed, establishes the pricing (e.g., MTurk, Clickworker).
Work features	
Work granularity	This feature specifies the granularity of a task, which ranges from complex projects of new product and innovation development to decomposed, small tasks at a micro level (Hoßfeld, Hirth, & Tran-Gia, 2011).
Worker selection	This feature specifies the crowd's skill-set. Workers can be recruited from a targeted, high-end niche crowd (e.g., data scientists from Kaggle.com) to a crowd of unspecified, general individuals from the public (e.g., turkers on MTurk).
Work coordination	The coordination between worker and requester ranges from little interaction (e.g., MTurk) to frequent interaction.
Work collaboration	The crowdsourced work can be independent (e.g., requiring individual work) or inter-dependent (requiring the joint efforts of multiple workers).

On one hand, this work's relative microness, at least on the surface, characterizes this work environment as unattractive: workers perform tiny pieces of repetitive tasks for pennies and mostly in isolation. On the other hand, the popularity of micro-task crowdsourcing (e.g., Bratvold, 2011; Kaganer et al., 2013) suggests that there is something beneath the surface that demands examination. Therefore, in this study, we focus on the perceptions of crowdworkers and seek to identify factors that motivate them to participate in micro-task crowdsourcing work environment. Specifically, we investigated MTurk, one of the largest micro-task crowdsourcing platforms that offered access to a large number of crowdworkers and micro tasks. In March 2012, MTurk had more than 250,000 registered workers and over 280,000 available tasks (Satzger, Psaier, Schall, & Dustdar, 2013). We browsed the MTurk website in October 2014 and found more than 400,000 registered workers and over 408,900 tasks. Thus, MTurk, with its large pool of crowdworkers and job requesters and the variety of tasks, makes a suitable context for our investigation.

3 Theoretical Foundations

Two streams of research broadly inform our study: micro-task crowdsourcing and work design. We review crowdsourcing studies to identify gaps in our understanding of motivation in micro-task crowdsourcing. We then use the work design theoretical perspective as a sensitizing framework to address the research questions. More specifically, we draw on the key concepts from Hackman and Oldham's (1975, 1976) job characteristics theory to help us reveal the critical drivers that motivate individuals to engage in the CSWE.

3.1 Crowdsourcing and Motivation

Four motivating factors emerged from our analyzing the crowdsourcing literature. First, financial factors have been salient in motivating individual participation (e.g., Brabham, 2008, 2010; Kaufmann, Schulze, & Viet, 2011; Muhdi & Boutellier, 2011). Second, community-oriented factors (e.g., attachment to the community) have also drawn people to certain types of communities, such as iStockphoto and Threadless (Brabham, 2008, 2010) or a Swiss innovation community (Muhdi & Boutellier, 2011). Third, task-related design factors (e.g., task autonomy, skill use, and task meaningfulness) enrich CS work, resulting in improved output quality (Moussawi & Koufaris, 2013; Rogstadius et al., 2011). Finally, hedonic factors (e.g., personal enjoyment) have also attracted individuals (e.g., Brabham, 2008) to crowdsourcing, though few studies have mentioned this motivation type. Although insightful, these four motivating factors do not fully explain the emerging phenomenon of micro-task CS that features low financial rewards and minimal social interaction. Moreover, these studies are predominantly descriptive studies based on structured surveys or experiments using college students (e.g., Moussawi & Koufaris, 2013; Rogstadius et al., 2011). Therefore, they do not sufficiently capture the work context from crowdworkers' perspective to provide a nuanced and rich understanding of this complex phenomenon.

Moreover, many of these studies examine the motivational factors that drive workers' performance instead of workers' participation in CSWE. For example, Rogstadius et al.'s (2011) experiment on MTurk demonstrates that framing a task as meaningful (e.g., helping others) can indeed improve the quality of workers' output, while, in their field experiment, Chandler and Kapelner (2013) found that task meaningfulness significantly increased the quantity of output but did not bring significant change in quality. These mixed results suggest that, to enhance our understanding of the micro-task crowdsourcing phenomenon, we need to understand—from the crowdworkers' point of view—why they participate in crowdsourcing in the first place. To bridge these gaps, we conduct an inductive study to develop a more nuanced and comprehensive understanding of the motivational factors that collectively drive crowdworkers to the micro-task CSWE.

3.2 Work Design Perspective

Work enrichment perspective challenges and is at odds with the classical work design approaches inspired by Frederick W. Taylor (1911): it premises that jobs should be enriched rather than simplified to enhance work quality (Herzberg, 1966, 1976). The work enrichment research stream from this perspective centers on a job's motivational potential. Based on the expectancy theory of motivation, job characteristics theory (JCT) (Hackman & Oldham 1975, 1976) is one of the most "complete theories for explaining job design characteristics and their relationships to work motivation" (Torraco, 2005, p. 89). Given our focus on work characteristics that drive crowdworkers, we use JCT as our theoretical foundation.

At its center, JCT posits that certain job characteristics enhance the likelihood that workers will find the work meaningful, feel responsible for work outcomes, and have accurate feedback regarding their work

outcomes, all of which will foster their intrinsic work motivation (Hackman & Oldham 1975, 1976). In particular, JCT posits five core job characteristics that influence job holders' motivation: 1) skill variety, which refers to the degree to which the job requires a variety of skills and talents in carrying out the work; 2) task identity, which refers to the degree to which the job requires a whole and identifiable piece of work from beginning to end; 3) task significance, which refers to the degree to which the job has a substantial impact on other people's lives and on the world; 4) autonomy, which refers to the degree to which the job provides substantial freedom and independence; and 5) job-based feedback, which refers to the degree to which the job provides clear information about individual performance. When all three psychological states—meaningful work, personal responsibility, and knowledge of their work outcome—are present, a jobholder is internally motivated to perform a job well. During the decades since Hackman and Oldham's (1975, 1976) JCT model appeared, a large number of empirical studies have applied and extended JCT. In their meta-analysis, Fried and Ferris (1987) reviewed nearly 200 studies to assess the JCT model's validity and found that the 200 studies tend to support the multidimensionality of job characteristics but that they agree less on the exact number of dimensions for job characteristics. Further, the meta-analysis suggests that the effects of job characteristics on work performance vary as a function of individual or situational differences.

Since the 1970s, organizational work has changed in part due to advancements in information technology. The nature of the workforce has changed from assembly workers in manufacturing plants (the context for Hackman and Oldham's research) to knowledge workers who engage in the service economy (Orlikowski & Scott, 2015). To reflect the change in the new organizational forms of work, Parker, Wall, and Cordery (2001) propose an elaborated model of work design that adds antecedents (i.e., external and internal organizational factors), expands the work characteristics (group level and individual level), and differentiates the outcome variables between individual/group outcomes and organizational outcomes. Humphrey, Nahrgang, and Morgeson (2007) expand on work design theory by integrating motivational, social, and work context characteristics. We argue that micro-task crowdsourcing is transforming the work context and, consequently, that we need to re-examine the motivational properties of JCT in the micro-task CSWE to assess whether we need to revise/extend the JCT perspective to explain the psychology of crowdsourcing work. In addition, the CSWE context provides an opportunity to draw attention to the enriching properties of work made possible by the material properties of digital technologies.

4 Research Method

4.1 Research Site and Data Collection

The site selected for this research, Amazon Mechanical Turk, provides an opportunity to collect rich text narratives regarding individuals' participation in micro-task CSWE. To register as a crowdworker, a person first creates a worker account on MTurk and provides a bank account number for depositing payment. Then, the worker can view a collection of micro tasks—referred to as "human intelligence tasks" (HITs) on MTurk—watch tutorial videos, view a sample of the required work, accept a HIT, and start crowdwork. Individuals must submit completed HITs online on MTurk for the job requesters to review; these job requesters then decide whether to approve the completed work. Requesters pay the amount listed for the HIT if they approve the work. However, they may reject the work and not pay; MTurk records such a rejection in the worker's performance history and uses it as a basis for its "master qualification".

MTurk allows job requesters to publish descriptions of their HITs and make the HITs available to all registered crowdworkers. Each HIT includes a job title, description of the work, expiration date, time allotted, keywords, workers' required qualifications, workers' required geographic locations, and monetary reward. Topics of HITs fall under seven major categories: data processing, categorization, sentiment, tagging, content, business feedback, and academic research. Examples of data processing HITs include verifying data entry, collecting data, and cleaning duplicate/incorrect data files. A categorization HIT can be categorizing products and checking data accuracy in catalogs, while a sentiment HIT can be rating the sentiments in tweets, press coverage, and customer comments. A tagging HIT includes generating key words for images, advertisements, or websites so that one can easily index and search them. Content HITs range from reviewing and editing content to writing abstracts/articles on specific subjects. A business feedback HIT may be rating the accuracy of Web search results or providing feedback on new products. Finally, academic research HITs involve completing surveys or participating in scientific studies.

To elicit crowdworkers' narratives, we created a survey HIT and posted it on the MTurk website. Workers could take the survey and be compensated through the MTurk system as with any other type of HIT. Since

we wanted to elicit explicit statements on the CSWE's motivation attributes, we asked the crowdworkers to share their experiences and opinions by responding to a list of open-ended questions such as:

- What would you like to change about doing crowdsourcing jobs on Mechanical Turk? Why? Please provide examples.
- Does doing crowdsourcing jobs on MTurk allow you to meet your career goals? Why or why not? If not, then please tell us why you are still working as a crowdworker.
- Would you consider doing crowdsourcing work as your full-time job? Why or why not?

The respondents responded to the questions in writing. In addition, we collected demographic information related to respondents' household income, employment status (e.g., full-time employed), crowdsourcing tenure (months working on MTurk), and effort (hours and HITs on a weekly basis). We required the crowdworkers to be located in the United States because focusing on workers in the US allowed us to control for confounding factors inherent in different cultural or economic contexts. We compensated workers with US$2.00 for completing the survey HIT; on average, they spent approximately 16 minutes, which corresponds to 2.5 cents/minute or US$7.5/hour[2]. We collected detailed responses from 55 crowdworkers, and they received the survey HIT well.

4.2 Sample Characteristics

In our data sample of 55 crowdworkers, 56 percent were males and 44 percent were females. The average age of the workers was 33 years (SD 10.9), with the youngest being 18 and the oldest 66. One third of the workers (33%) were in the 25-30 age group, with the remainder in the following age groups: 18-24 years (22%), 31-40 years (24%), 41-50 years (15%), and 51+ years (7%). This demographic is consistent with Buhrmester, Tracy, and Gosling (2011), who found that MTurk participants are slightly more demographically diverse than standard Internet samples. Overall, 55 percent of workers were between 18 and 30 years old, similar to the percentage of young U.S. workers (20-35 years) in Ipeirotis' (2010) data sample. The demographics of our sample are consistent with the sample in Ross et al. (2010) with the exception of one age group: 22 percent in the 18-24 year group compared to 40 percent in Ross et al. (2010).

The workers' average tenure with MTurk was 12.9 months (SD 14.1). On average, they worked on 805 HITs (SD 1189) and spent 23.8 hours (SD 14.7) on a weekly basis. Forty percent of them achieved the MTurk master qualification[3], and 60 percent were regular (non-master) workers. Of the 55 respondents, 40 percent had a household income of US$25,000 to US$49,999 followed by 25.5 percent with $50,000 to US$74,999. Of the remaining categories, 10.9 percent earned less than US$25,000, 18.2 percent earned US$75,000 to US$99,999, and 5.5 percent earned US$100,000 or more. As for their education level, 10.7 percent had graduated high school, 25.5 percent had attended some college but had no degree, 12.7 percent had an associate degree, 41.8 percent had a bachelor's degree, and 9.1 percent had a graduate degree. They had obtained their highest degrees in various disciplines, including computer science, biology, economics, education, engineering, history, information technology, music theater, nursing, business management, and political science.

Crowdworkers in our sample reported performing a variety of micro tasks. Among the seven categories available on MTurk, the respondents frequently worked on academic survey HITs, categorization HITs, and business feedback HITs. However, all of them did multiple types of HITs. Among the 55 workers in the data sample, 55 percent of them performed all seven types of HITS and 28 percent performed six types of HITS. Only 7 percent performed four or fewer types of HITs. No workers did only academic or categorization HITs.

Our sample size is similar to that in prior IS studies using the RCM method (Deng & Chi, 2012; Nelson, Nadkarni, Narayanan, & Ghods, 2000). Studies based on the RCM method have used the point-of-redundancy concept to calculate the adequacy of sampling (Narayanan & Armstrong, 2005). As one does not know the point of redundancy until one constructs RCMs, the number of required respondents is a judgment call. We adopted a sample size consistent with Nelson et al. (2000), who interviewed 50 experts in the IS maintenance context. The point of redundancy in our data analysis (as we explain below) suggested that our sample was sufficient for exhausting the concepts of motivating attributes in the CSWE. In Section 4.3, we present our data analysis that used RCM.

[2] The effective hourly rate of our survey HIT met the Federal minimum wage at the time of the survey administration. It is at a level comparable to or better than the rate in prior studies (e.g., Ipeirotis, 2010).

[3] MTurk master is an elite status granted by MTurk. As indicated on the MTurk website, to become a master, a worker is required to meet a HIT approval rate of 95% or higher for all requested HITs and to complete at least 1000 HITs.

4.3 Data Analysis: Revealed Causal Mapping

Following the RCM guidelines (Narayanan & Armstrong, 2005), we analyzed crowdworkers' narratives to evoke constructs, an approach consistent with prior IS studies (e.g., Deng & Chi, 2012; Nelson et al., 2000). To extract causal relationships from a respondent's explicit statements, we used a four-step process: 1) elicit data, 2) construct revealed causal maps, 3) validate the maps, and 4) interpret the maps. Next, we illustrate the four steps.

4.3.1 Step 1: Data Elicitation

We conducted the survey on MTurk. Fifty-five respondents (crowdworkers) typed their responses online to the open-ended questions that we describe earlier. In applying the RCM method, researchers often rely on two major types of data: text-based data and interview data (Narayanan & Armstrong, 2005). As we focused on revealing the cognitive structure pertaining to the CSWE, it was appropriate to use open-ended questions, similar to an interview approach (Nelson et al., 2000), and to analyze the narratives of individual participants.

4.3.2 Step 2: Construction of Revealed Causal Maps

Following Nelson et al. (2000), we systematically derived revealed causal maps of crowdworkers' perceptions. First, we identified causal statements from an informant's narrative by looking for key words such as "because", "therefore", "so", "while", and "if–then". Then, we coded each causal statement into cause and effect and replaced the "cause" and "effect" in a statement with the concepts (the key words or phrases) and linked "cause" and "effect" with an arrowed line to obtain a causal map at the concept level. We highlighted repeated words and phrases such as "work flexibility" and "job autonomy" and grouped these words/phrases into constructs. Finally, we aggregated all concept-level maps across all informants to obtain a causal map at the construct level (refer to the example in the Appendix). We (the two researchers) coded the narratives of five respondents together, discussed the coding results, and developed the coding scheme. Then, we independently coded the narratives of the remaining 50 crowdworkers. Finally, we compared the coded constructs and linkages and resolved coding discrepancies. In total, we identified 20 concepts and 815 linkages. The inter-coder reliability reached an acceptable Cohen's Kappa index of 0.837, which exceeds the required level of 0.70 (Lombard, Snyder-Duch, & Bracken, 2002; Ryan & Bernard, 2002).

4.3.3 Step 3: Validation

We reviewed the work design literature (Hackman & Oldham, 1975, 1976) to validate the concepts and constructs identified in the RCMs. Similar to Nelson et al. (2000), we used the point of redundancy to evaluate the convergence of concepts elicited from the responses. In our analysis, the 20 concepts converged at the 25th respondent, which means that we found no new concept in the map of the 26th respondent or beyond, which indicates the sufficiency of our sample size.

4.3.4 Step 4: Interpretation of the Maps

We examined the key constructs and linkages uncovered in the map (see Figure 1 in Section 5). The constructs and their associations demonstrate important drivers for workers' participation in the CSWE.

5 Results: Constructs Driving Crowdworkers' Participation in the Micro-task CSWE

Our data analysis revealed seven constructs that are essential to understanding crowdworkers' participation in the CSWE. The four motivational factors driving participation include crowd work context, crowdsourcing task characteristics, crowdworker needs, and digital work control. We derived three major socio-psychological outcomes (hedonic, work value, and CS satisfaction) from CSWE engagement. Our data analysis revealed new constructs (e.g., digital work control) and concepts that drive one's CSWE participation. Table 2 lists the constructs and concepts identified in the study.

Table 2. Revealed Concepts and Constructs of Crowdsourcing Work Environment

Construct	Construct definition	Concept
1) Crowd work context	The work setting characteristics of micro-task crowdsourcing	**Workplace flexibility**: the flexible arrangement in which a crowdworker perform work at a location other than the normal worksite such as at home or at a mobile, temporary work space (Modified from Hill et al., 2008). **Equipment simplicity:** the ease of using common and familiar equipment (e.g., a computer) and technology (e.g., the Internet) to perform crowd work (Derived from the study).
2) Crowdsourcing task characteristics	The properties of a task performed in micro-task crowdsourcing	**Job autonomy**: the degree of freedom and control that a job provides to a crowdworker on job decision making (e.g., what jobs to take, how to perform the jobs) (Hackman & Oldham, 1976). **Task variety**: the availability of diverse types of tasks (Hackman & Oldham, 1976) **Task significance**: the meaningfulness and significance that results from completing a task (Hackman & Oldham, 1976). **Task clarity**: the degree of clarity of the instructions and procedures for performing a task (Kirkpatrick & Locke, 1996). **Micro-task payment**: the rate of monetary compensation for each completed micro task (Derived from the study).
3) Crowdworker needs	Crowdworkers' personal needs met by micro-task crowdsourcing	**Financial need**: the workers' desire for monetary reward from conducting work (Brabham, 2008, 2010). **Personal growth need**: individuals' desire to use their current stocks of knowledge and to develop new skills (Hackman & Oldham, 1976). **Pro-social need**: individuals' desire to contribute to community and society (Brabham, 2008, 2010).
4) Digital work control	The digitized work processes that control risks and enhance operational efficiencies and effectiveness of micro-task crowdsourcing	**Micro-task programmability**: the extent to which technical functionalities programmed in the MTurk platform facilitate the micro-task crowdsourcing processes (Derived from the study). **Payment automation**: the payer's approving the completed tasks in a timely manner and according to the pre-specified criteria and to their automatically disbursing payment into workers' accounts (Derived from the study). **Standardization**: the standards and policies that MTurk has implemented to manage crowdworkers, job requesters, and job processes (Derived from the study). **Risk mitigation**: the enforcement of measures and procedures to ensure compliance, to mitigate disputes, and to prevent and control scamming activities on MTurk (Derived from the study).
5) Hedonic outcome	The pleasures of engaging in micro-task crowdsourcing	**Passing free time productively**: individuals' desire to work during their leisure time by completing HITs (Derived from the study). **Experiencing enjoyment**: individual experience of having fun, relaxation, or excitement from doing crowd work (Brabham, 2008).
6) Work value outcome	Fulfilling important work-related values through micro-task crowdsourcing	**Lifestyle integration**: considering family life as important as work and having a desire to maintain a balanced and integrated lifestyle (Schein, 1985). **Independence**: having a strong sense of freedom and independence in one's work choices, such as deciding one's working hours and career path (Schein, 1985). **Security**: one's ability to make steady income from doing crowdsourcing jobs (Schein, 1985).
7) CS satisfaction outcome	The contentment derived from participating in micro-task crowdsourcing	**CS satisfaction***:* the degree to which crowdworkers' experiences in the CSWE meets their expectations (Derived from the study).

5.1 Crowd Work Context

The workers on MTurk perceived work context as a key factor driving their participation in the CSWE. Our data analysis revealed two dimensions of crowd work context that were salient to this workforce: workplace flexibility and equipment simplicity.

Workplace flexibility refers to the flexible arrangement for an individual to work from home or when traveling away from home. For a majority of the crowdworkers, the option of working from home was a major reason driving their involvement in crowdsourcing. Interestingly, workers were drawn to this opportunity for different reasons: for some (e.g., stay-at-home parents), the workplace flexibility allowed them to take care of children while working on MTurk; others found themselves working more effectively in the relaxing surroundings of home. And, for others, working from home released them from physical constraints.

> *I like that I can make some money at home while I stay home and raise my daughter. I can make as much money doing what I'm doing on this website as I would be making working a full time job and then subtracting what daycare would cost, gas, lunch, etc*. (Female; 23 years; associate degree; household income US$25,000-US$49,999; unemployed)
>
> *An example of a comfortable turking environment for me would be my home, as it's where I'm the most relaxed and where I'm more focused on doing work on Mturk*. (Male; 19 years; some college education; household income US$75,000-US$99,999; other employment)
>
> *I suppose mostly what I like is the ability to work from home. I had major spinal surgery 5 months ago that has me gradually working my way back to work full time.* (Male; 46 years; bachelor's degree; household income US$75,000-US$99,999; employed full-time)

Moreover, crowdworkers enjoyed the flexibility in being able to perform work from any convenient location. After registering on MTurk, an individual can search for and complete micro tasks using a computer in any location with an Internet connection—whether in a café or on a moving train. In this regard, MTurk workers can build a mobile "office" at their discretion, which the remark below reflects:

> *I am able to earn on my own schedule. No boss in a traditional sense. I can work anywhere I have an internet connection, at the beach or at home or wherever I would want.* (Male; 44 years; bachelor's degree; household income US$50,000-US$74,999; employed full-time)

To a large extent, the pervasiveness of the Internet, the ubiquity of Wi-Fi, and the availability of mobile technologies and devices enable workplace flexibility in a CSWE. Some workers appreciated the ability to choose from a variety of computer devices, while others found the indispensable role of mobile devices (e.g., smart phones) critical to engaging in the micro-task CSWE. Two workers noted:

> *The ability to work on a variety of devices, from my desktop to my cell phone, allows me great mobility when it comes to turking in areas outside of my room or home*. (Male; 19 years; some college education; household income US$75,000-US$99,999; other employment)
>
> *I can even complete HITs using my cell phone while waiting in the car at the bus stop for my kids, while waiting for appointments and in car rides when my husband is driving.* (Female; 28 years; some college education; household income US$50,000-US$74,999; unemployed)

Equipment simplicity refers to the ease of using common, familiar equipment (e.g., a computer) and technology (e.g., the Internet) to perform crowd work. Equipment simplicity greatly lowers the entry barriers to using such equipment and technology. Crowdworkers considered it a big plus to just use a computer to perform the work and often compared this simple equipment requirement to the financial investments required for non-CS work. Two workers noted:

> *I was originally most attracted to working for Mechanical Turk because it requires nothing more than a computer and some free time, both of which I have available to me.* (Female; 22 years; some college education; household income US$75,000-US$99,999; employed full-time)
>
> *Many other jobs that allow you to work from home require additional equipment, like software programs, faxes, scanners, and phone lines. With Mturk and crowdsourcing in general you don't really need to purchase any additional equipment or put out any extra money to make money doing tasks.* (Female; 25 years; bachelor's degree; household income US$50,000-US$74,999; unemployed)

Organizational scholars consider the context (e.g., physical demands and work conditions) surrounding the conduct of work an important design characteristic that affects employees' work engagement (Humphrey et al., 2007). However, the respondents' perceptions of the crowd work context differ in nature from those described in the work design literature. The respondents viewed digitized crowd work as much more comfortable, portable, or affordable than traditional jobs constrained by work requirements (such as work cubicles, 8 a.m. to 5 p.m. work hours, and dress codes).

5.2 Crowdsourcing Task Characteristics

Task characteristics emerged as a major construct affecting workers' engagement. It comprised five properties (See Table 2), three of which (job autonomy, task variety, and task significance) are consistent with those in the general JCT framework (Hackman & Oldham, 1976). However, the crowdworkers revealed two new characteristics that are critical to the CSWE context: task clarity and micro-task payment.

Consistent with Hackman and Oldham's characterization (1976), we define job autonomy as the degree of decision making freedom and control a worker has. Our study nuances the scope of autonomy to include freedom in job selection, such as choosing micro tasks (HITs). The following remark illustrates the importance of such freedom:

> *You can accept a hit [HIT], but you don't have to. It is totally up to you whether to take the job or not, and if you get into a job and you end up not wanting to do it, you can return it and let someone else complete it. The flexibility is a major draw for me.* (Female; 30 years; bachelor's degree; household income US$25,000-US$49,999; employed part-time)

Crowdworkers' decision power in the CSWE is not limited to job selection; they also enjoy the freedom to decide where, when, and how to perform micro tasks. One worker explained:

> *It's a very flexible way to make some money. On mTurk you can work or not work at any given time, and can choose what sorts of things to work on based on mood or inclination.* (Female; 29 years; some college education; household income < US$25,000; unemployed)

Task variety refers to the availability of diverse types of tasks. In the CSWE, crowdworkers can access a variety of tasks (e.g., seven categories of HITs) and configure their work by selecting HITs that are likely to meet their desired outcomes. One worker explained this benefit:

> *I like having a variety of tasks to do. It is fun to do a survey and then a writing task and then a categorization task. It stimulates the mind and makes working interesting.* (Female; 61 years; graduate degree; household income $50,000 - $74,999; employed part-time)

Moreover, task significance, the meaningfulness and significance of completing a task, emerged as an important motivational factor. Workers were attracted to tasks that were meaningful and that they perceived to have a broader impact. One worker explained:

> *Aside from making money, I like the fact that I am helping people with studies and surveys. It makes me feel good that what I do helps people.* (Female; 45 years; some college education; household income US$75,000-US$99,999; employed full-time)

Task clarity is a new concept that we found to be important in the digitally mediated workplace, which lacks physical presence and face-to-face communication. Consistent with the definition in organizational studies (Kirkpatrick & Locke, 1996), we define task clarity as the degree of clarity of the instructions and procedures for performing a micro task. In the online workplace, crowdworkers desired to have a clear understanding of "what" and "how" with regard to a micro task, which the following quote reflects:

> *They [HITs on the MTurk] are interesting and have instructions that are clear and easy to follow. I like that they usually give you several examples of the job. They give you a right and a wrong example.* (Female; 39 years; some college education; household income US$25,000-US$49,999; employed full-time)

Micro-task payment is another new concept revealed in the CSWE; it refers to the rate of monetary compensation for each micro task completed. While appreciating the income, crowdworkers also expressed frustration with the low payment rate for micro tasks and called for job requesters to increase the payment rate. From two different perspectives, two workers expressed their perceptions of micro-task payment as follows:

> *The best thing about doing crowdsourcing jobs on Mechanical Turk is getting paid. This is because I am just doing surveys to get money. Even better are the ones that are simple and quick with a*

> *higher pay.* (Male; 24 years; bachelor's degree; household income US$25,000-US$49,999; employed full-time)
>
> *The job requester wants a ridiculous amount of work (sort through 100 images and tag them) for a really poor amount of money ($0.05/HIT).* (Male; 19 years; some college education; household income US$75,000-US$99,999; other employment)

In summary, the virtual, boundary-less nature of the CSWE attracts the crowdworkers. It facilitates the configuration of micro tasks based on individual preferences, and the open, ubiquitous access to the CSWE increases the autonomy of crowdworkers in determining their own work patterns, such as work schedules and task choices.

5.3 Crowdworker Needs

Three types of needs—financial, personal growth, and pro-social—triggered individual interest in crowd work. We discuss these needs in greater detail below.

Financial need refers to crowdworkers' desire to earn a monetary reward for their work. Financial returns as a motivator was most pronounced in the reasons for workers' initial involvement in the CSWE. When asked why they became a crowdworker, most cited "looking for ways to make money online" as a major reason. Yet, their financial situations varied, as two workers recalled:

> *I started this [doing crowdsourcing jobs] just to earn extra money for Christmas time and have found I love being part of Mechanical Turk.* (Female; 58 years; high school graduate; household income US$25,000-US$49,999; other employment)
>
> *I became a crowd worker largely because the economy is terrible and where I live the unemployment rate is one of the highest in the country. I turk out of necessity, because I need the money to supplement my income.* (Male; 43 years; bachelor's degree; household income US$50,000-US$74,999; unemployed)

Personal growth need refers to crowdworkers' desire to use their knowledge and to develop new skills. Some crowdworkers found crowdsourcing a useful outlet to maintain their skills and keep themselves "in the game". Others found crowdsourcing cognitively challenging, which, in turn, helped them sharpen their skills. One worker illustrated the desire to achieve personal growth in the CSWE as follows:

> *I love to do hits [HITs] that challenge me. For example, I am rusty on Algebra—so I like to learn and test myself.* (Female; 66 years; graduate degree; household income US$75,000-US$99,999; other employment (retired))

Finally, pro-social need refers to crowdworkers' desire to contribute to the community and society. The CSWE provides an outlet for contributing to communities that traverse geographic boundaries. Crowd work such as academic surveys enables individuals to contribute their knowledge and share their experiences, which satisfies their pro-social needs. The following statement illustrates pro-social need:

> *I really enjoy doing academic surveys. …I feel like I am doing something useful and contributing to interesting research.* (Female; 38 years; some college education; household income US$25,000-US$49,999; employed part-time)

The CSWE's capability to fulfill crowdworkers' personal needs throws some light on why individuals continue to participate in this kind of digital workplace. As their narratives revealed, most crowdworkers engaged in crowd work because of their short-term financial needs. Yet, they continue to participate because the work satisfies their non-financial needs, including growth needs and pro-social needs. Studies based on JCT (Fried & Ferris, 1987) suggest that the effects of job motivational properties on work performance vary by individual differences, such as individual growth needs. In micro-task CS, growth needs (i.e., skill development) remain important but financial needs and pro-social needs emerged as additional motivational factors.

5.4 Digital Work Control

Digital work control also emerged as a new construct in the crowdsourcing context. Digital work control refers to digitized work processes that control risks and enhance the operational efficiencies and effectiveness of

micro-task CS from the perspective of crowdworkers[4]. Our analysis revealed four important properties of digital work control: micro-task programmability, payment automation, standardization, and risk mitigation.

Micro-task programmability refers to the extent to which technical functionalities programmed in the MTurk platform facilitate or impede micro-task CS processes. While expressing their appreciation of the CSWE's open access and ease of connectivity (as we discuss in Section 5.1), crowdworkers also shared (in frustration) their desire for certain functionalities that could be embedded in the MTurk platform. Depending on the aspects of micro-task CS engagement, two types of programmability emerged: digital features for managing the task process (i.e., the HITs) and for managing workers' own work history.

The first type refers to the digital features for managing HITs prior to work and during the work process, including capabilities for searching, selecting, approving, and returning HITs. In particular, respondents emphasized the functionality of searching for HITs and requesters. Although MTurk offers the function to search and filter HITs, workers expressed a desire for more diverse and advanced functionalities. In the response below, the worker provided a "wish list" of technical features for MTurk:

> *The search engine is woefully inadequate. It needs more filters, ways to combine filters, categories, just a ton of work. Right now I have to rely a lot on the mturkforum.com "Great HITs" threads, when that really shouldn't be the case.* (Male; 28 years; bachelor's degree; household income < US$25,000; unemployed)

The second type, the digital feature for tracking workers' own work history, includes all the technical functionalities built on the MTurk platform to allow workers to store, organize, and review records of their completed micro tasks. In the CSWE, a crowdworker will commonly complete 1,000 micro tasks in a week (the mean number of weekly HITs is 805 in our data sample). To avoid doing duplicate work, crowdworkers must keep track of their own work history, which can be time-consuming. One respondent explained:

> *It would be easier if before accepting a HIT the requester could add something to see if you are eligible or not for that particular study. Every time that I want to complete a HIT I have to go back and try to recall if that study seems familiar to me, which is very time consuming.* (Female; 23 years old; some college education; household income $25,000- $49,999; employed full-time)

Payment automation refers to the payer's approving the completed tasks in a timely manner and according to the pre-specified criteria and to their automatically disbursing payment into workers' accounts. This payment automation aspect was very popular and highly appreciated, which the quote below reflects:

> *Crowdsourcing jobs pay quickly and approval rates are high. I usually see an approval within a few hours and [am] paid within a day.* (Female; 31 years; bachelor's degree; household income US$50,000-US$74,999; employed full-time)

Standardization refers to uniform standards and policies to manage crowdworkers, job requesters, and job processes. Workers frequently mentioned two desired standardizations: are standardization of task instructions and worker evaluations. First, standardization of task instructions refers to implementing rules on expected time and pay when posting HITs. Requesters had discretion over HIT job descriptions, requirements, and payment. Consequently, the task instructions and the expected time and pay varied tremendously. Crowdworkers called for some standardization of the task instructions that job requesters posted, which the quote below reflects:

> *I would just like it if there were some standardization. One requestor will call a hit [HIT] "short" if it takes 5 minutes, while another will call it short if it takes 45 minutes. And often the pay is the same for both so it is up to us to decide which is worthwhile to proceed with.* (Female; 61 years; graduate degree; household income US$50,000-US$74,999; employed part-time)

Second, standardization of worker evaluation includes the eligibility, criteria, and procedures for master status. Crowdworkers often complained about MTurk's lack of controls in managing the master qualification process and sought clarification:

> *I think that Amazon should set out specific rules for Master's so that people aren't just randomly guessing if they will get it or not. Better yet, I think Master's should be eliminated and there should just be a ranking scale that everyone succumbs to.* (Female; 33; bachelor's degree, household income US$50,000-US$74,999; other employment)

[4] The concept of controls used in accounting practices inspired this definition.

Risk mitigation refers to the enforcement of measures and procedures to ensure compliance, mitigate disputes, and prevent scamming activities on MTurk, which has become increasingly important in the micro-task CSWE. Crowdworkers overwhelmingly expressed frustration with MTurk's inadequate procedures for resolving disputes between crowdworkers and requesters as one worker expressed:

> *Some requesters love to take advantage of workers, and they know they can get away with it because Amazon does not really enforce their Terms of Service or any of the rules they have put forth. I would like to see more authoritative involvement from Amazon with regards to duplicitous requesters.* (Male; 23 years; some college education; household income < US$25,000; unemployed)

One rising concern that crowdworkers shared was the increasing number of scams (fake HITs) and scammers (requesters who take completed work but refuse to pay). In these situations, crowdworkers unfairly incurred financial losses. To make the matter worse, requesters' refusal to pay—whether for a legitimate reason or because they were scamming—resulted in a lower job acceptance rate or even in a blocked account, which damaged a worker's' reputation on MTurk. Hence, it's not surprising that crowdworkers pleaded for tighter controls and scammer screens:

> *Stop all scammers who put up HITs and do not pay. I am very diligent about providing quality work that coincides with the HIT's instructions, but for some HITs it does not matter. They are just posted because they are a scam.* (Male; 49 years; some college education; household income < US$25,000; other employment)

Implementing the governance mechanisms mentioned above would enforce control over task scams. Without intervention from MTurk, crowdworkers will continue to worry about scams, which prevents them from achieving a sense of work security in the crowdsourcing environment.

In the CSWE, digital work control has become an integral component of work design to improve work efficiency and effectiveness. In analyzing the crowdworkers' narratives, we found four digital properties that are critical to the smooth operation of micro-task CS. While crowdworkers appreciated the technological capabilities for managing HIT posting and automating payment approval and disbursement, they found that MTurk lacked in digital features for managing worker evaluations, handling worker-requester disputes, and blocking scammers. From workers' perspective, these digital work controls were pivotal to sustaining the crowd work environment.

5.5 Hedonic Outcome

Crowdworkers manifested two types of hedonic outcomes: passing free time productively and experiencing pleasure. Passing free time productively refers to crowdworkers' sense of accomplishment and productivity by participating in the CSWE, which the following quotes reflect:

> *MTURK is great in my spare time because I can hop on for an hour and feel like I have accomplished something with my time.* (Male; 36 years; associate degree; household income $25,000- $49,999; employed full-time)

> *I think that one of the best things is that it gives me something to do that makes me feel productive, instead of wasting time on the internet*. (Male; 28 years; graduate degree; household income $75,000-$99,999; employed full-time)

Experiencing pleasure refers to, for example, having fun, feeling relaxed, or feeling excited. The entertainment value may be related to the online navigation experience or to specific types of HITs, such as game-related or Web-related HITs. Sometimes, the effortless aspect of a micro task entertained crowdworkers and sometimes the wait for a new, high-paying HIT made the work process exciting, which the following quotes reflect:

> *I enjoy doing short mindless HITs in order to relax and not think about my regular full-time job.* (Female; 26 years; bachelor's degree; household income $50,000-$74,999; employed full-time)

> *It is addictive and somewhat like gambling because I am always waiting for the next high paying job. I know that I can make 10-20 dollars in less than an hour and it is a great adrenaline rush.* (Male; 30 years; high school graduate; household income $25,000-$49,999; employed full-time)

5.6 Work Value Outcome

We found participation in the CSWE to fulfill crowdworkers' work values. Three work values—lifestyle integration, independence, and security—emerged as most important. Individuals who value lifestyle integration choose work that allows them to make all the major sectors of their lives (such as work and family) function as an integrated whole (Schein, 1985). For some, micro-task CS allowed them to attend to their family and student life simultaneously while fulfilling job requirements. As one explained:

> *Crowdsourcing allows me to integrate my lifestyle into my work because I am able to work on tasks and simultaneously care for my family and tend to my graduate studies.* (Female; 34 years; bachelor's degree; household income US$25,000-US$49,999; other employment)

The work context and the characteristics of micro tasks enabled this integration. In particular, the freedom to decide one's work schedule and the workplace flexibility gave crowdworkers control over their work to achieve a work-life balance. One respondent elaborated:

> *The crowdsourcing jobs allow me to make my own decisions about how to schedule my work, because I have a young daughter at home and it is imperative that I be able to choose when I work. I have to work around her and my family's schedule. This is why I like MTURK so much, because I can choose what, how and when I will make money.* (Female; 33 years; bachelor's degree; household income US$50,000-US$74,999; other employment)

Individuals who value independence have a strong need to do things their own way, in their own time, and independently of others. These individuals find organizational roles constraining and prefer career paths that are out of the ordinary (Schein, 1985). The CSWE achieved this career value. One worker commented:

> *Crowdsourcing enables me to have complete independence and autonomy in my work, which is very important to me. I am reclusive, independent minded, and often don't work well with others, so I enjoy having as much freedom as I like in my work schedule and having nobody to report to except myself.* (Female; 38 years; some college education; household income US$25,000-US$49,999; employed part-time)

Finally, security refers to one's ability to make steady income from doing crowd work in a safe work environment. We define security in the CSWE differently than Schein (1985), who defines security as the ability to keep one's work in the same location rather than moving. In the CSWE, physical location becomes irrelevant. Depending on their purpose for earning income, crowdworkers may offer different assessments with regard to achieving this work value. The CSWE gave some crowdworkers an extra cushion of security by offering them the opportunity to conveniently earn extra income and save their earnings for the future (i.e., a sense of financial security):

> *It [crowdsourcing] does give me a little bit of security. If my current job is lost I know that I can make enough from working here to pay my bills.* (Male; 25 years; some college education; household income US$25,000-US$49,999; employed full-time)

However, a crowdworker who depends totally on this open sourcing platform for making a living may not perceive a sense of security partly because of task scams and the low payment rates. One worker elaborated:

> *There is no security; you are at the mercy of the requesters and Amazon and Amazon doesn't give a shit about the workers because they know there are plenty of us out there.* (Male; 43 years; bachelor's degree; household income US$50,000-US$74,999; unemployed)

Our data analysis revealed that the crowdworkers' perception of how well CS fulfilled their important values in part determined their attraction to micro-task CS. As we describe above, crowdworkers frequently cited three values—lifestyle integration, independence, and security—attained by participating in micro-task CS, which evidences the critical role of "person-related" characteristics such as work values in guiding an individual's work-related decision making processes (Schein, 1985).

5.7 CS Satisfaction Outcome

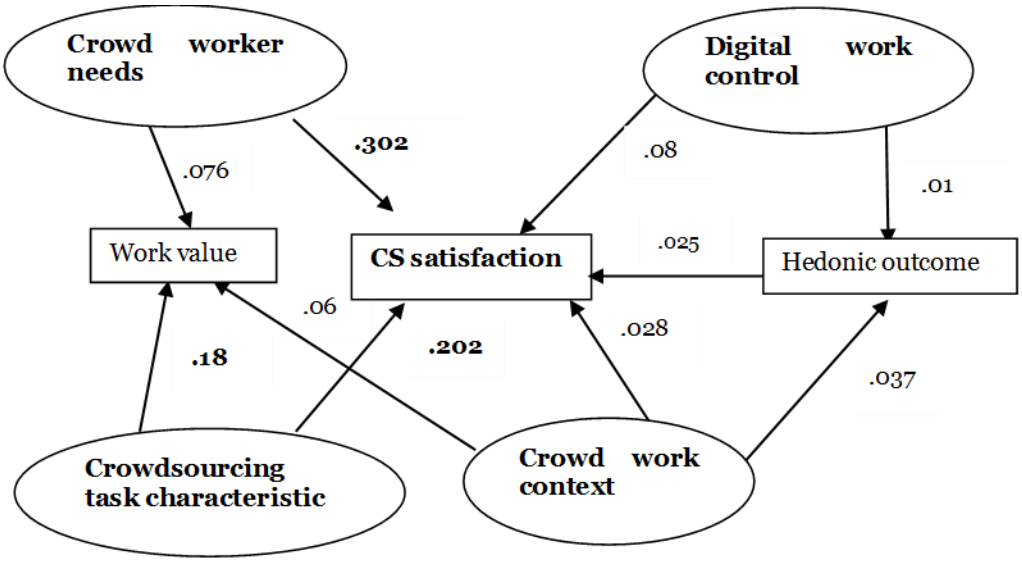
CS satisfaction captured how content individuals were with their participation in micro-task crowdsourcing. CS satisfaction results from a portfolio of factors, whether context-related (workplace flexibility, equipment simplicity) or task characteristics (job autonomy, task variety). Two workers explained:

> *I am extremely satisfied. I can choose what I do and I choose whatever is easiest and more enjoyable for me. Being there is so much enjoyable work, even if it pays pennies, is what keeps me satisfied with my jobs here. Were they forced onto me I wouldn't be, but since I can cherry pick as I please I feel no reason to not be satisfied.* (Male; 25 years; some college education; household income < US$25,000; unemployed)
>
> *Overall, I am satisfied enough to continue working at it. I am satisfied that I can earn something from the comfort of my home while working my own hours and maintaining freedom with my schedule. It also saves me gas for commute.* (Male; 25 years; high school graduate; household income US$25,000-US$49,999; unemployed)

Although the crowdworkers were mostly satisfied with the CSWE, the absence of digital work control led to frustration that diminished their overall satisfaction.

> *I'd say 85% of the time I'm happy with what I'm doing. When a HIT expires, when I get a rejection, when a project is complicated or there's technical issues, I can get a little frustrated but that's all uncommon.* (Female; 44 years; bachelor's degree; household income US$25,000-US$49,999; employed part-time)
>
> *On a scale of 1-10 I would rate my happiness with MTURK as an 8. Sadly it seems like there are a few kinks that need to be worked out with communication between workers and requesters, and there also has to be some form of intervention from Amazon itself.* (Female; 40 years; some college education; household income US$25,000-US$49,999; unemployed)

The aggregated RCM (Figure 1) presents the key constructs and the associations between constructs. In the map, an oval shape depicts a cause and an effect depicts a square shape. The arrow indicates the link between a cause and an effect. The confluence of work design characteristics revealed in this study shaped crowdworkers' satisfaction.



Based on 815 linkages identified from 55 MTurk crowd workers; The number associated with a linkage reflects the percentage of that linkage over all the linkages identified.

Figure 1. Aggregated Revealed Causal Map of Crowdworkers

In analyzing the crowdworkers' perceptions, we did not find the psychological states of "personal responsibility" and "having knowledge of their work outcome" that Hackman and Oldham (1975, 1976) identify to be salient to this new work form. We found only one of the three JCT psychological states, experience of meaningful work. One possible explanation is that the crowdsourcing jobs (HITs) in this study were mostly micro tasks, and knowledge of one's work outcome is implicit in the requesters' approving payment. Moreover, hedonic outcomes and work values, which are important in understanding why crowdworkers participate in the CSWE, are mostly absent from JCT studies. These differences between our findings about the CSWE and the key properties of work enrichment in the JCT model suggest that, to

explain micro-task CS, we need to expand the JCT model to include characteristics associated with the digitally enabled and mediated open source work environment.

6 Discussion: Emerging Research Themes

Our study's results reveal an interesting coupling of the classical work-design perspectives based on Taylor's (1911) principles of scientific management and Hackman and Oldham's (1975, 1976) work-enrichment perspective. These perspectives regarding how best to design work for optimal production outcomes often conflict because the key principles of Taylorism (such as work simplification) are difficult to harmonize with the work enrichment principles (Pruijt, 1997). However, these two manners of working seem to coexist in the CSWE. On one hand, the requesters (crowdsourcers) followed Taylorism's simplification principle by slicing and dicing jobs into low-paying micro tasks that they could complete without any interaction. On the other hand, the crowdworkers configure a portfolio of these micro tasks to curate and craft their work based on the HIT properties that best enriched their work, an approach congruent with the enrichment perspective. This coupling of the two job-design perspectives, in large part made possible by CSWE technologies, helped explain the popularity of micro-task crowdsourcing. Individuals often use information technology in ways that reinforce Taylorist patterns (Pruijt, 1997); thus, its use in the CSWE to enrich work is novel and refreshing.

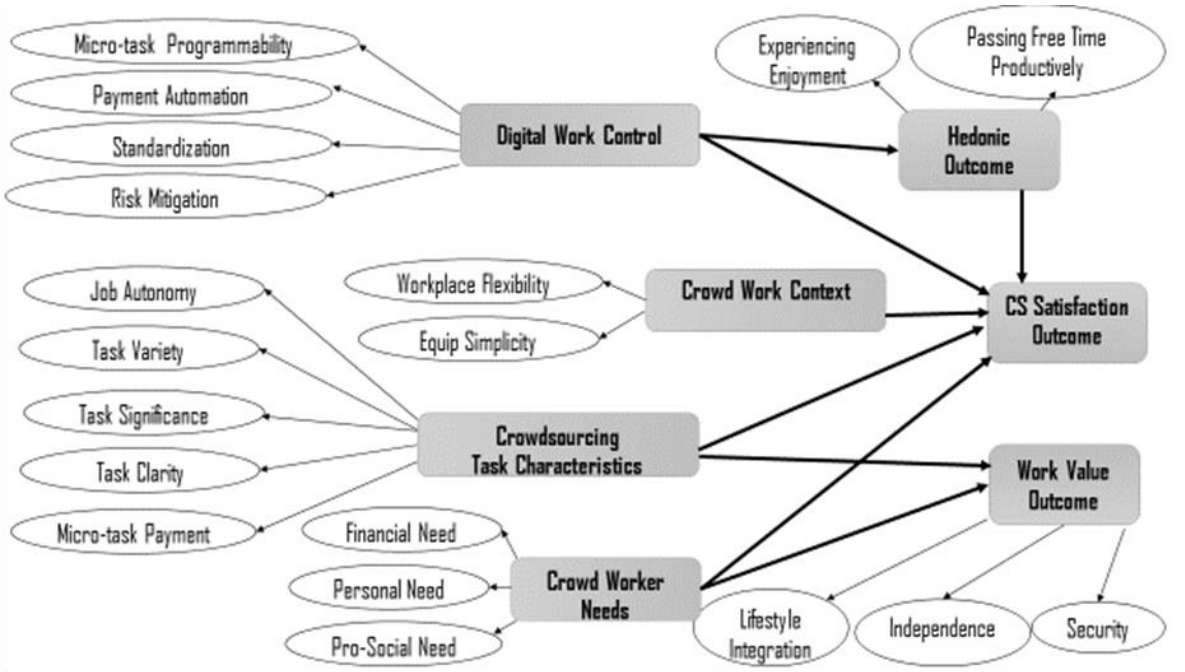
However, we need to further untangle and investigate the coexistence of seemingly orthogonal work design alternatives in the digital work environment. Our findings can serve as a foundation to stimulate future work design research. More specifically, these findings can help in engaging the IT artifact to extend and expand the work design theories to new work contexts and forms such as crowdsourcing. Investigating these key themes may help orchestrate flexible work systems that blend the Taylorist and anti-Taylorist work practices. Below we discuss the theoretical contributions of our study and key research themes that emerged from the results.

6.1 Extending Work Design Theory—Micro-task Crowdsourcing Perspective

By revealing the diversity and richness of the motives that drive participation in the CSWE, we expanded the JCT model—designed and tested in the traditional work environment—to the micro-task crowdsourcing work environment. Using the revealed causal map (Figure 1) that inductively emerged from our data analysis, we can deduce a multitude of variance models that can help explain and predict the nature (e.g., positive or negative) and magnitude (strength) of the effects of these factors on crowdworkers' participation in the CSWE. Figure 2 illustrates one such variance model.

Our causal map suggests that three outcomes influence individuals to participate in crowdsourcing: fulfillment of hedonic needs, derivation of work values, and satisfaction with CS. A confluence of four factors determine these three outcomes: crowd work context, crowdsourcing task characteristics, crowdworker needs, and digital work control. A measurement and structural model can test the relationships among the determinants and outcomes to predict how these factors facilitate or impede workers' participation in the CSWE. By including work values and worker needs, the two important person-related characteristics, our model extends JCT studies, most of which have excluded hedonic or work value outcomes from their frameworks (Hertel, 2007).

Further, our findings elicit dimensions that describe the makeup of the revealed constructs, which provides a foundation for future research to test the predictive validity of this variance model. As our study builds on micro-task crowdsourcing, which could be salient to our understanding of crowd participation motivation, we need to test the model in different crowdsourcing contexts. The presence and importance of the factors may differ by the context. For example, research has frequently revealed community-related factors as critical in innovation crowdsourcing (e.g., Brabham, 2008, 2010; Muhdi & Boutellier, 2011; Zheng, Li, & Hou, 2011). By contrast, research has found that task-related factors are prominent in the crowdsourcing for micro tasks (e.g., Kaufmann et al., 2011; Mason & Watts, 2009).



The grey boxes are the constructs reveled in our causal map which are illustrated in Figure 1.
The white ovals are the concepts that characterize the makeup of specific constructs as listed in Table 2.

Figure 2. Theoretical Model: Determinants of Crowdworkers' Participation in the CSWE

6.2 Extending Work Design Theory by Engaging the IT Artifact

Our study reveals that the enriching properties of work should consider information technology—specifically, the digital medium—through which individuals conduct and deliver work. In doing so, our study begins to theoretically engage with the IT artifact by revealing the important material properties of technologies that drive individual participation in the CSWE. IS scholars (e.g., Leonardi & Kallinikos, 2012; Robey, Raymond, & Anderson, 2012; Yoo, 2012) encourage greater and deeper engagement with IT's materiality by granting IT artifacts a clear theoretical status. In particular, Robey et al. (2012) offer two strategies for theorizing materiality: extend theories that nominally address IT or extend theories established before the advent of IT artifacts and, thus, "ignore" IT. Our research has employed the second strategy by engaging JCT—a work design theoretical stream established before the advent of CS that "ignored" the role of IT—to explain workers' participation in the CSWE. JCT has informed IS research (e.g., Ang & Slaughter, 2001; Thatcher, Stepina, & Boyle, 2003), but the role of IT in this research stream is under-theorized. Although we did not focus on IT properties in this study, the CSWE affordances (see below) we found were critical in explaining individual participation in the seemingly undesirable micro-task crowdsourcing work. By uncovering the set of affordances, we began to engage CSWE's materiality in explaining this phenomenon. Future research could build on this initial analysis to examine CSWE's materiality more deeply and through other theoretical lenses.

6.3 Micro-task Crowdsourcing Work E*n*vironment—A System of Affordances

The micro-task CSWE technologies include hardware devices (such as mobile devices used to access the MTurk platform), software interfaces (such as the MTurk interface), MTurk software applications (such as automatic payment services), and communication services (such as the Internet and Wi-Fi services). The results of this study suggest that affordances that these technologies provide are instrumental in driving crowdworkers' participation. Affordances, in general, refer to "the possibilities for goal oriented action afforded to specific user groups by technical objects" (Markus & Silver, 2008, p. 622). More specifically, CSWE affordances refer to the micro-task crowdsourcing actions (e.g., ability to register to work as a crowdworker, ability to set up automatic payments) that CSWE technologies provide to crowdworkers, requestors, and platform providers.

Our analysis uncovered the following seven (distinct yet intertwined) affordances from the crowdworkers' perspectives: portability of work (adapted from Cousins & Robey, 2012), simplicity of work equipment

(derived from this study), affordability of work equipment (adapted from Yoo, 2012), automation and virtualization of work processes (derived from this study), modularity of micro tasks (adapted from Yoo, 2012; Yoo et al., 2010), and Internet ubiquity (adapted from Yoo, 2012; Yoo et al., 2010; Cousins & Robey, 2012). These affordances work in concert to allow workers to get paid instantly (automation) for a digitized job (virtualization) that can be done quickly and independently (modularity) from anywhere at any time (portability and ubiquity) using equipment that is inexpensive (affordability) and easy to use (simplicity).

The affordability of work equipment (Yoo, 2012) (i.e., inexpensive PCs and other digital devices for conducting crowd work) significantly lowers the cost of participating in online labor markets. Crowdworkers indicated that equipment affordability was crucial to their participating in micro-task CS. The simplicity of work equipment (i.e., using common computers and mobile devices as gateways to Web-based work platforms) made participation cognitively simple and afforded easy entry into the online labor market without much equipment, training, or education. Although our study participants often mentioned simplicity and affordability characteristics together, the characteristics provided distinct affordances because a technology that is simple to use may or may not be affordable (or vice versa). Portability of work (Cousins & Robey, 2012) refers to work equipment multiplicity that allows crowdworkers to perform micro tasks from diverse digital devices, including desktop, laptop, and handheld devices with unobtrusive switching between devices. This functionality enables spatial and temporal extensions that allow individuals to work from anywhere at any time. The ubiquity of the Internet (Cousins & Robey, 2012; Yoo, 2012; Yoo et al.; 2010) and the ability to connect to the CSWE from a variety of locations (café, subway train, bus stop, beach, home) provide access to micro tasks for a wide range of crowdworkers[5], which creates a global workforce.

The remaining three affordances, although enabled by the digitization of micro tasks and work processes, are distinct. First, automation of work transactions embedded in the CSWE (e.g., automatic payment after a micro task is completed) affords crowdworkers speedy access to, acceptance of, and payment for micro tasks. Numerous work processes are automated, such as workers' immediate access to HITs upon registration, automatic approval/rejection and evaluation of completed HITs, and instant payment after submitting a HIT. The CSWE's ability to program instructions that it quickly and instantly executes upon HIT submissions not only provides speed but also allows for standardization of processes that crowdworkers can depend on. Virtualization of work processes provisions virtual work cubicles that allow workers to store, organize, and review their work history. Virtualization differs from automation because automation intends to remove/minimize human involvement, whereas virtualization provisions more options for the crowdworkers, such as returning HITs they no longer want. Modularity (Yoo et al., 2010), the architecture that allows one to decompose work into simple, modular units (e.g., HITs) that individuals can quickly and independently finish affords crowdworkers the flexibility to configure their work by accepting and sequencing tasks based on their work preferences.

All the seven affordances collectively make the micro-task work design characteristics appealing to crowdworkers; each affordance on its own is insufficient. Therefore, one should view these seven characteristics as a system of affordances that jointly provide workers with diverse goals (e.g., seeking mobility so they can work and travel for leisure vs. preferring to work from home) and distinct work possibilities (e.g., to take or return HITs as their life schedules change). The CSWE system of affordances jointly makes the seemly unattractive work popular by creating flexible work routines that fit well into inflexible schedules. Circling back to our earlier characterization of the microness of this environment's work features, on one hand, conspire to make this work appear to be like a sweatshop, but these very elements when *implicated in a technical system* create affordances that advantage the crowdworkers. For instance, the digitization of small pieces of work (enabled by modular architecture), work routines (facilitated through virtual work processes), and transactions (made possible by automated work transactions) transform the simplified, boring, and repetitive tasks into portable digitized work pieces that workers can quickly, cheaply, and unobtrusively plug into their daily routines.

In summary, the possibilities and opportunities for work actions that CSWE technologies provide are influential in enriching work that, on the surface, may seem unpleasant. We do not claim to have revealed all the key CSWE affordances (as doing so was not our focus). However, we do hope that this study initiates scholars to more deliberately explore IT artifacts in the context of work design theories, which have traditionally ignored the material role of IT. Future research can advance this stream of work by not only identifying additional properties of the CSWE that can provide greater job engagement and enrichment but

[5] Our sample comprised MTurk workers in the United States. The Internet ubiquity may vary greatly based on workers' location.

also helping design CSWE functionalities and capabilities to make digital work places more desirable despite their unattractive compensation practices and the lack of sociality.

As our findings illustrate, CSWE allows crowdworkers to enrich their jobs by curating their work. However, these technologies, simultaneously, allow requestors to simplify work so that a cheap online global workforce can complete it while allowing platform providers to govern as profitable intermediaries. We need to further explore this system of affordances, which *appears* to provide mutual benefits to all three key stakeholders. More specifically, future work needs to extend our notion of the CSWE as a system of affordances to investigate questions such as the following: do the CSWE technologies really create a symbiotic system to the mutual benefit of all three entities or do they advantage one entity over the others? What are the key CSWE affordances that benefit the job requestors (e.g., does the system allow them to disaggregate and re-aggregate their work? How does CSWE help mitigate the overhead costs of micromanaging their work?)? How do these new forms of technology-driven production systems evolve in order to remain both economically viable and symbiotic?

6.4 Crowd Work as a Temporary Detour or a Legitimate Career Pathway?

The study suggests that the CSWE may serve as an interim support system or safety net for individuals in the midst of a career change or career disruption. The monetary reward of doing micro tasks is an important factor that initially attracts individuals to MTurk. Moreover, the crowdworkers in our study also reported that they continued this work because of non-monetary rewards such as the enjoyable and meaningful experiences on MTurk. For unemployed individuals or those with a different employment status (e.g., stay-at-home parents, college students), platforms such as MTurk also serve as an emotional safety net by giving them a sense of worth as they navigate and transit their way out of their current circumstances.

Our data analysis shows that crowdworkers initially viewed MTurk as temporary work or as a detour, but, after experiencing this work environment, some workers made CS work their full-time careers. People's personal experiences outside their jobs have influences on their career decisions and goals (Las Heras, 2009). In this regard, crowdworkers' experiences with the CSWE over time may have an impact on their long-term career goals and career choices. Future research needs to examine more closely whether the CSWE provides a temporary support system for coping with career transitions or an alternative career pathway that is credible and sustainable.

6.5 Crowd Work as a Form of Job Crafting

Our study shows that the CSWE allows people to arrange their work around their family and life, which gives them the flexibility to craft and curate jobs in the CSWE. In traditional work settings, job crafting is a process during which employees change elements of their jobs and relationships with others to revise the meaning of the work and the social environment at work; employees are "job crafters" who engage in a job-changing process physically (by changing a job's task boundaries), cognitively (by changing the way they think about the relationships among job tasks), and relationally (by changing the interactions and relationships they have with others at work) (Wrzesniewski & Dutton, 2001, p.180). By adapting their jobs, job crafters create different jobs for themselves in the context of defined jobs and improve their job effectiveness. Subsequent studies (e.g., Richtel, 2008) show employees' preferences for a more flexible work design, including reduced work weeks, unpaid vacations, and leaves of absence.

Although crafting jobs in itself is not a new concept, crafting jobs in the digitally enabled work environment of micro-task crowdsourcing has emerged as a significant yet under-explored phenomenon. Job crafting approaches provide valuable theoretical perspectives for examining crowdworkers' career pathways. On one hand, career theories enable one to uncover the critical work and personal factors that drive individuals to choose micro-task crowdsourcing as a career option. On the other hand, the job-crafting perspective further allows one to evaluate crowdworkers' preferences in crafting their portfolio of micro tasks outside of organizational boundaries to meet their professional and personal goals. Future research needs to examine how these three entities—crowdworkers, job requestors, and platform providers—exert their personal agencies to determine how (or whether) these new forms of work allow crowdworkers to craft novel career pathways.

7 Concluding Remarks

In this study, we examined the motivational properties of the CSWE. Our work reveals important constructs unique to the CSWE, including workers and their perceptions, task design, work context, and digital platform properties, and it expands work design research by capturing personal characteristics and material role of

IT. Still, one should interpret out results with caution. First, we derived them from crowdworkers from a single crowdsourcing platform that focuses on micro tasks. Other forms of crowdsourcing, such as contest-based (Innocentive.com for solving scientific and technological problems), may present different job characteristics or different worker behaviors. In addition, job requesters may provide different insights. Second, it is not sufficient to describe the motivational characteristics of micro-task crowdsourcing in general terms; we need to contextualize our understanding of crowdworker behavior by considering the nature of the micro tasks (i.e., game HITs vs. research study HITs) and the different categories of outcomes (CS satisfaction, hedonic outcomes, and work value outcomes). Further, in our study, we asked crowdworkers why they *participated* in micro-task crowdsourcing on MTurk not why they *would not participate*. Future research should further differentiate motivating factors from hygiene factors. Finally, we need to differentiate initial participation from continued participation. In this study, we focused on job motivational characteristics (e.g., job autonomy, task variety) that crowdworkers value; we did not examine the influences of these factors over time.

Since one can "slice" and "digitize" organizational work and, therefore, crowdsource it at low cost, this micro-task CS model is likely to be rapidly diffused to other fields if it can sustain the crowd's engagement and participation. To enhance and update our understanding of this dynamic, social phenomenon, IS researchers should further examine the conceptual model derived from the study's findings. Future research can advance this stream of work by not only identifying additional CSWE properties to enable greater work engagement and enrichment but also designing CSWE functionalities and capabilities to make digital workplaces more desirable despite their unattractive compensation practices and lack of sociality. The emerging research themes identified in this study offer, we hope, useful guidelines for more research into this evolving, digitally enabled, and mediated work environment.

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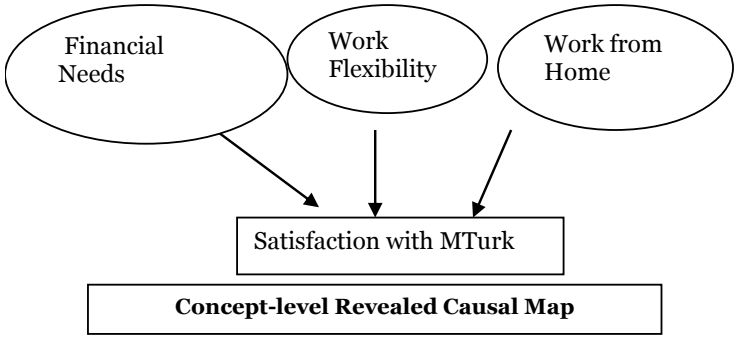
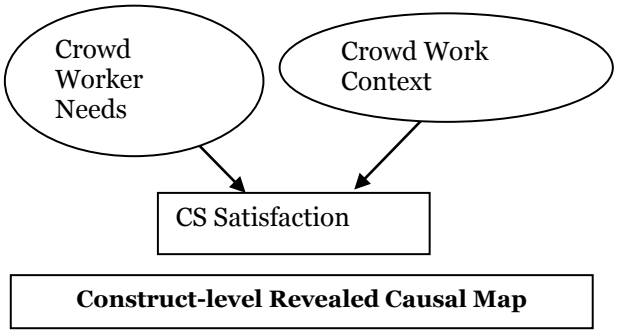
Appendix

Table A1. An Illustration of the Four-step Procedure for Constructing Causal Maps

Step 1 Identifying causal statements	**Example of causal statement:** *I am very satisfied with the opportunity to work on Mechanical Turk because I can make extra money in addition to my full time job, and it gives me the flexibility to set my own schedule and work from home.*
Step 2 Constructing raw causal maps	**Cause:** 1) I can make extra money in addition to my full time job, 2) it gives me the flexibility to set my own schedule, 3) (it gives me the flexibility) to work from home. **Effect:** I am very satisfied with the opportunity to work on Mechanical Turk.
Step 3 Coding	**Raw phase (coded concept)** Make extra money (financial needs) Flexibility to set my own schedule (work flexibility) Flexibility to work from home (work from home) Satisfied with the opportunity to work on MTurk (satisfaction with MTurk)
Step 4 Recasting raw causal maps into concept-level revealed causal maps	
Step 5 Creating a construct-level revealed causal map	

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