MIS QUARTERLY EXECUTIVE

How IT Leaders Can Benefit from the Digital Crowdsourcing Workforce[1]

A growing segment of the gig economy is what we IT term IT crowdsourcing (ITCS), where clients post IT development projects (typically of about two weeks duration) on an ITCS platform for digital crowdworkers to bid on. We describe how these platforms work and the profiles of some typical digital crowdworkers. We also provide guidelines for IT leaders who want to benefit from this "hidden" source of skilled digital workers.[2, 3]

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Digital Workers and the Gig Economy

The gig economy is rapidly transforming labor markets in the U.S. and other countries worldwide by creating demand for short-term contracts or freelance work, and reducing the availability of full-time permanent jobs. In the U.S., 20% of the workforce participates in freelance contract work, and experts expect that proportion to rise to 50% within the next 10 years.[4] Our focus is this article is on what this changing labor market means for IT leaders. Are they prepared for the gig economy? Can they take advantage of it to find talent in an increasingly difficult hiring market for digital professionals?[5] What challenges will they face as they tap into this growing freelance workforce to meet their staffing needs? What can they do to overcome these challenges and ready themselves to benefit from this new labor market?

This article provides answers to these questions from the perspective of a group that is sometimes overlooked: *workers*. We focus on one group of gig economy workers: digital workers[6] who use crowdsourcing platforms to obtain and deliver work and to receive remuneration for the work they do. The term we have coined for this segment of the gig economy is *information technology crowdsourcing* (ITCS).[7] By sharing what we have learned about this particular group, we can provide guidance to IT leaders on the actions they can take to benefit from the gig economy.

1 10.17705/2msqe.00002

2 Michelle Kaarst-Brown, Tim Weitzel, Jeria Quesenberry and Fred Niederman are the accepting senior editors for this article.

3 A previous version of this article was presented at the *MIS Quarterly Executive* Academic Workshops held at the Hawaii International Conference on System Sciences on January 3, 2018. The valuable feedback received during the workshop has been incorporated into the manuscript.

4 National Public Radio recently broadcast a series of articles examining the growth and implications of contractors in the U.S, economy, an example of which can be found in Noguchi, Y. "Rise of the contract workers: Work is different now," January 22, 2018.

5 Difficulties in staffing digital roles is a commonly cited concern of IT executives. See, for example, Kappelman, L., McLean, E., Johnson, V. and Torres, R. "The 2015 SIM IT Issues and Trends Study," *MIS Quarterly Executive* (15:1), March 2016, pp. 55-83. Kappelman2016

6 Our focus in this study was on digital workers who participate in technology-related tasks—e.g. programming, project management, requirements gathering, security assessment, etc.

7 In this article, we use the term "crowdsourcing" to describe a form of micro-sourcing (small contract engagements) that are facilitated by online transaction environments. This approach is based on that presented in ~~Oshri, I., Kotlarsky, J. and Willcocks, L. P. *The Handbook of Global Outsourcing and Offshoring*, Palgrave Macmillan, 2011.~~

The growth of the gig economy raises many ethical and regulatory questions,[8] and it is still unclear how this new form of working[9] affects workers and the organizations that employ them. Broadly, it creates both challenges and opportunities for employers. The challenge for IT leaders is that as digital workers leave the traditional workforce to become freelancers, the problems of recruiting and keeping top digital talent are magnified. However, IT organizations that successfully adapt to the gig economy can better manage their staffing and training costs and have greater access to digital talent.

A common misconception is that working in the gig economy is just for millennials[10] or for workers who have limited employment options.[11] However, emerging research has shown that workers of all ages and skillsets are joining the gig economy, and doing so in record numbers,[12] including digital workers engaged in ITCS. In our research for this article, we examined how digital workers are engaging with the gig economy (the research methods are described in Appendixes 1 and 2).

Based on our findings, we show how corporate IT leaders can leverage the "invisible" stream of IT talent in the ITCS segment of the gig economy. C-level IT executives can benefit from our insights into ITCS working in four ways:

1. Understanding how ITCS is being used by other organizations
2. Exploring potential impacts of ITCS on digital workers, the firms that employ them and society in general
3. Learning about challenges and opportunities of using ITCS to obtain benefits in recruiting and retention
4. Applying our guidelines for successfully using ITCS in IT service delivery.

Understanding How ITCS Platforms Work

ITCS has several important distinctions from historical freelance contracting.[13] Online platforms can dramatically reduce the transaction costs associated with identifying, scheduling and compensating for work. Be it Uber, Airbnb or Instacart, online platforms have become significant factors in facilitating the gig economy. For workers whose primary activities are in the digital domain, online platforms can provide a forum both for job acquisition and for content delivery. For technology-related freelancing, like ITCS, online platforms create a virtual global marketplace and can support integrated work environments to complete digital tasks.

One aspect of the gig economy is the growth of IT service delivery through online ITCS platforms, such as Upwork and Freelancer, to support small-scale IT development contracts.[14] Workers who contract through these platforms are an on-demand digital workforce that completes specified small tasks for predetermined rates of remuneration. The platforms facilitate the financial transactions between worker and client and protect the stakeholders from potential abuse or fraudulent behavior.

In our research for this article, we evaluated three of the largest ITCS platforms (by project revenue). With each of these platforms, individual crowdworkers bid for specific jobs that are posted on the platform. The bidding, billing, task management and communication processes are embedded within the platform to minimize direct

8 The potential regulatory challenges of crowdsourcing are explored in Williard, R. P. "Crowdsoureing: Libertarian Panacea or Regulatory Nightmare?," *Journal of Online Higher Education* (1:1), January 2017. Further exploration of some of the ethical challenges of crowdsourcing are explored in Deng, Xuefei, K. D. Joshi, and Robert D. Galliers. "The duality of empowerment and marginalization in microtask crowdsourcing: Giving voice to the less powerful through value sensitive design." *Mis Quarterly* 40.2 (2016): 279-302. Deng2016a

9 Noguchi, Y., op. cit., January 22, 2018. This National Public Radio broadcast examined the growth of the gig economy and its implications.

10 Millennials are often cited as driving the trend away from traditional work schedules. See, for example, Taylor, K. "Why Millennials Are Ending The 9 to 5," *Forbes.com*, August 23, 2013, available at https://www.forbes.com/sites/katetaylor/2013/08/23/why-millennials-are-ending-the-9-to-5/#6271ebe2715d.

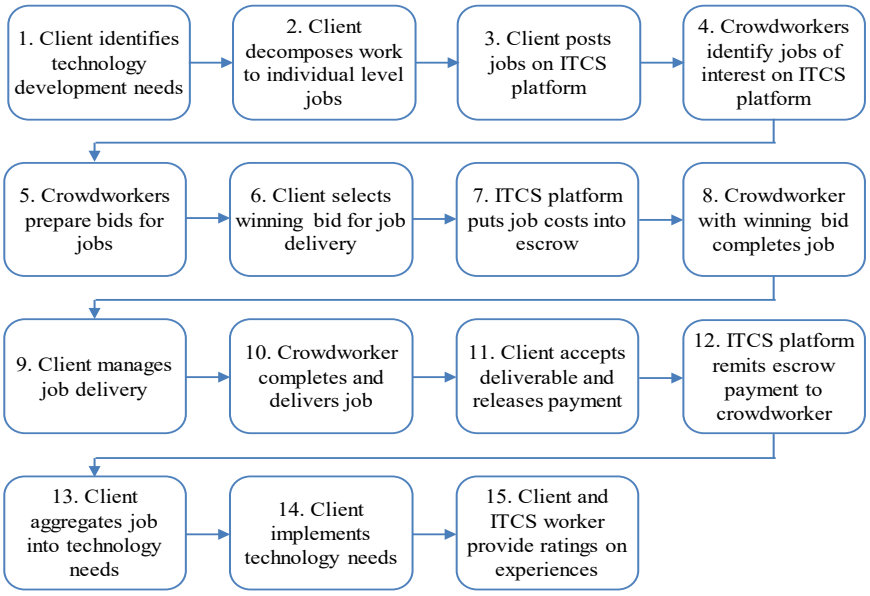
11 Some studies have shown that the unemployed and under-employed are attracted to working in the gig economy, which potentially can reduce the overall entrepreneurial activity of the gig economy. For more information, see Burtch, G., Carnahan, S. and Greenwood, B. N. "Can You Gig It? An Empirical Examination of the Gig Economy and Entrepreneurial Activity," *Management Science*, 2018.

12 Early anxieties about the growth and implications of the gig economy are highlighted in Scheiber, N. "Growth in the 'Gig Economy' fuels Work Force Anxieties," *New York Times*, July 12, 2015.

13 An in-depth discussion of the literature regarding outsourcing, including the characteristics of freelance work, can be found at Lacity, M. C., Khan, S. A. and Willcocks, L. P. "A Review of the IT Outsourcing Literature: Insights for Practice," *Journal of Strategic Information Systems* (18:3), September 2009, pp. 130-146. Lacity2009

14 For a discussion of the concept of "microsourcing" through small contracts as one type of sourcing vendor, see Oshri, I. et al., op. cit., 2011.

Figure 1: ITCS Workflow Process



outside interaction between the client and the crowdsourced worker. The platforms support a limited number of project structures (e.g., time and materials, fixed bid) and collect escrow funds from clients to provide payment protection for workers.

In reviewing the design of ITCS platforms, we used standard process modelling approaches.[15] A high-level breakdown of the basic workflow process for projects that are successfully completed via these ITCS platforms is depicted in Figure 1. While we recognize that IT development efforts may be cancelled prior to project completion, to simplify our review of ITCS platform design we did not consider the processes associated with project cancellation.

Before posting an IT project on an ITCS platform for crowdworkers to bid on, a client must define the project requirements and complete an initial project design. Unlike traditional outsourcing services, there are minimal resources available on ITCS platforms to assist with tasks such as requirements gathering or designing the application architecture. The small scale of the work typically posted on ITCS platforms can make it challenging to develop the requirements. A recent study examining one ITCS platform found job durations generally to be less than two weeks.[16] If the project is expected to require more than one crowdworker or more than two weeks to complete, the client should break the project up into multiple smaller jobs that can be posted on the ITCS platform.

Crowdworkers can view jobs that are available on ITCS platforms and prepare bids describing the intended delivery approach and proposed cost to the client. The client must evaluate the individual bids to determine which crowdworker, if any, will be awarded the contract.

Once a crowdworker's bid is accepted, the ITCS platform provides a mechanism for putting the agreed payment price into escrow, which protects the crowdworker against the cancelation of the project once the work is completed. Contracts and escrow are unique to the individual worker. Once the escrow payment has been collected by the ITCS platform, the crowdworker begins the job. ITCS platforms often include governance structures that provide clients with mechanisms

15 We followed standard process modelling techniques, as outlined by Curtis, B., Kellner, M. I. and Over, J. "Process Modeling," *Communications of the ACM (35:9)*, September 1992, pp. 75-90.

16 ITCS jobs are typically quite short (about two weeks); longer jobs are associated with lower levels of satisfaction for both workers and clients. See Kathuria, A., Saldanha, T., Khuntia, J. and Andrade Rojas, M. G. "Strategic Intent, Contract Duration, and Performance: Evidence from Micro-Outsourcing," Proceedings of Thirty–Sixth International Conference on Information Systems, Fort Worth, Texas, 2015. Kathuria2015

for monitoring project completion and facilitate remote monitoring of crowdworkers' activities. These governance structures are controls that focus on oversight and productivity management rather than effective technical collaboration for larger, more complex technology projects. When the job has been completed, and the client has had the opportunity to validate the work, the ITCS platform remits the payment to the crowdworker, minus the fee payable to the platform.

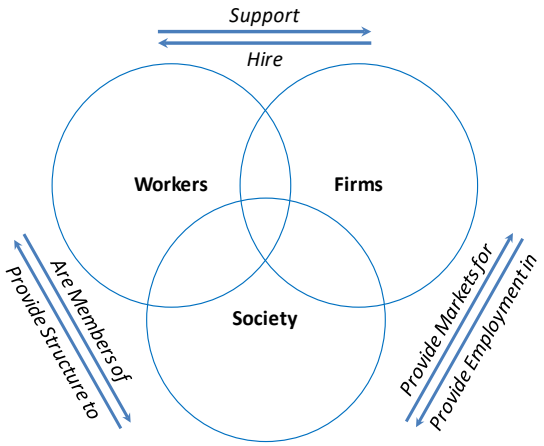
If the size and complexity of the overall project requires multiple ITCS workers to participate, the client is responsible for hiring each individual ITCS worker, validating and approving each individual job and integrating each completed job into the overall project. Clients are also responsible for integrating and implementing the completed jobs into their technology environments.

ITCS platforms collect extensive data for each job on both the client and the crowdworker. Clients and workers are given the opportunity to rate each other. Each ITCS platform aggregates ratings of crowdworkers and makes them available to future clients. The aggregate ratings of clients are made available to crowdworkers who are considering bidding on future jobs posted on the platform. The ratings and data collection system of each ITCS platform is unique, and data relating to a client or a crowdworker is only available via the platform on which the work was completed.

Benefits of ITCS for Workers, Firms and Society

ITCS provides benefits for workers, firms and society in general. ITCS workers are individuals who complete tasks posted on crowdsourcing platforms for predetermined rates of remuneration.[17] For these individuals, participation in crowdsourcing represents a type of employment. In ITCS, firms are the organizations that use, or could use, ITCS as a means of obtaining IT services and hiring additional temporary employees. As labor shortages in the digital workforce continue to grow, firms will face increasing challenges in meeting their staffing needs. ITCS provides IT leaders with a new source of digital workforce talent. As changes to workforce dynamics, such as those brought about by ITCS, continue to develop, there are both benefits and challenges to workers and firms, and to wider society—i.e., the shared community that includes individuals, families and communities where we all live and work. Figure 2 shows how ITCS can provide value-added benefits through the interplay between these three groups.

Figure 2: Value-added Benefits of ITCS



We identified five work dimensions that determine the ways in which workers, firms and society benefit from ITCS: 1) access to otherwise inaccessible talent, 2) a cost-effective workforce, 3) access to fractional[18] resources, 4) an on-demand workforce and 5) a willingness to take on difficult-to-fill positions.

Each of these five dimensions has implications for workers, firms and society. By understanding these potential influencing factors, firms and policy makers can be better prepared for the shifts in labor market dynamics toward greater use of contractors. Table 1 summarizes the benefits for workers, firms and society in each of the five dimensions.

17 An extensive exploration of the types of roles included in the IT workforce is presented in Kaarst-Brown, M. L. and Guzman, I. "Who Is the IT Workforce?: Challenges Facing Policy Makers, Management, and Research," Proceedings of ACM SIGMIS CPR [Computer Personnel Research], Atlanta, Georgia, April 14-16, 2005.

18 Part-time workers who also work part-time for other employers.

Table 1: ITCS Provides Benefits for Workers, Firms and Society

	Workers	Firms	Society
Access to Otherwise Inaccessible Talent	Provides a means to stay in the workforce outside traditional employment	Expands technology workforce	Provide individuals with the dignity of employment
Cost-effective Workforce	Can live in low-cost locations	Access to workers at competitive rates	Enables individuals in small communities to earn technology worker salaries
Access to Fractional Resources	Maximize earning potential	Can find highly specialized skills	Maximize worker contributions
On-demand Workforce	Flexibility in work volume and timing	Can hire workers as needed	Enables workforce size to adjust to demand
Willingness to Take on Difficult-to-fill Positions	Personal ownership of skill development; incentive to take on variety of tasks	Can fill temporary or repetitive work	Incentivizes workers to develop in-demand skills

Profiles of ITCS Crowdworkers

Digital workers have a variety of reasons and motivations for participating in ITCS. For some, their personal situation (e.g., health or childcare demands) makes traditional, inflexible IT employment unattractive.[19] Others perceive the repetitive nature of corporate work as boring or unfulfilling. Some simply like the challenge of solving new types of problems, while others like the flexibility of contract work. Some participate in ITCS in addition to traditional employment, while others work exclusively through online ITCS platforms.

We found that a broad spectrum of digital talent is attracted by the flexibility of ITCS contract work, and that the rich diversity of ITCS crowdworkers illustrated several ways in which the firms that employ them can benefit. Our study included 25 workers participating in ITCS. Although these workers were a diverse group, there were several common themes and benefits that workers gained from participating in ITCS. To highlight these benefits, we present below profiles of five of the workers who participated in our study. (The demographics of all those included in our study is provided in Appendix 2.) The experience of these five individuals is representative of others who participated in our research, and each illustrates how ITCS work differs from other outsourcing or freelancing work structures.

Profile 1: Stay-at-home Dad

"Stay-at-home Dad" is a 27-year-old single male with more than two children and a bachelor's degree. Participating in ITCS allows him to earn an income while balancing the needs of his young family. Previous studies have found that women with childcare responsibilities can find it challenging to participate in the digital workforce. We found that for some men with primary childcare responsibilities, crowdsourcing provides the flexibility that enables them to balance work and family responsibilities.

"[ITCS] allows me to have time for my kids, take them to school, pick them up, spend time with them, yet still financially provide for them."

Flexibility for "Stay-at-home Dad" is more than just being able to work around his children's daily schedules; it also includes the volume, complexity and timing of the ITCS work he does. He can take on simple repetitive work when financial needs demand it, but can also invest time in more complicated tasks to expand his skillset when financial needs are less pressing. This approach

19 A deeper look at the motivations of crowdworkers can be found at Deng, X.N. and Joshi, K.D., 2016. "Why individuals participate in micro-task crowdsourcing work environment: Revealing crowdworkers' perceptions," *Journal of the Association for Information Systems*, 17(10), p.648.

Deng2016

allows "Stay-at-home Dad" to be proactive in his skill development.

"I get to pick and choose the jobs I work on. I can pick really easy jobs for fast cash or pick complicated jobs that I haven't worked on before where I have the chance to learn new things and challenge myself."

The transparency of the online ITCS marketplace allows "Stay-at-home Dad" to identify which skills would provide the most value. ITCS platforms present a wide range of available tasks, allowing workers to better understand what skills are in demand. "Stay-at-home Dad" uses this information to expand his skills so he can meet this demand. Moreover, the ITCS task selection process provides a means of gaining practical experience in emerging skills.

"[ITCS] has allowed me to learn many things and get a better understanding of what kind of programming languages are mostly being used. … [It] has caused me to learn new languages like RoR and keeps me brushed up on skills like server administration … [and] keeps me programming every day."

In addition to supporting technical skill development, ITCS platforms can reduce the time required for administrative and business development activities. For ITCS workers like "Stay-at-home Dad," the capabilities provided by platforms allow them to focus on doing technical work rather than searching for prospective clients.

"[Without access to ITCS platforms] I would be out going door to door to local companies trying to get freelance IT work. … I like using [ITCS platforms] because it brings those looking to have work done to me."

For "Stay-at-home Dad," completing the work is only part of the challenge of being a contract worker: *"You still need to make sure you get paid."* The structure of ITCS platforms simplifies this type of administrative task by providing tools that "Stay-at-home Dad" appreciates, such as job notifications and payment protection. These capabilities let him focus on actually doing the digital work.

"[I like ITCS platforms because they provide] payment protection, and what I really like is the amount of daily jobs posted. I also like their RSS feeds, which I can customize and put on my own site so I don't have to log onto [an ITCS platform] to look at new jobs being posted in the areas that interest me."

"Stay-at-home Dad's" experience demonstrates that ITCS workers have visibility to the types of skills that employers are looking to hire and are able to select jobs that develop skills they need to compete for future work. For employers, providing workers with training on new skills can be challenging and expensive. However, the financial dynamics of ITCS align the skill development interests of employers and workers. Employers can leverage this dynamic by posting jobs that require new and emerging skills. ITCS workers like "Stay-at-home Dad" are willing to learn new skills in their own time so they can bid for work that requires these skills. When employers post new work on ITCS platforms, they provide opportunities for ITCS workers to develop new skills while gaining access to talent for difficult-to-fill roles.

Profile 2: Former Teacher

"Former Teacher" is a 27-year-old married female with no children and a bachelor's degree. She is a former high school math teacher who has turned her passion for technology into a source of income as a front-end developer. Since leaving teaching, she has worked full time in traditional technology employment and also as a freelance contractor through traditional temporary service agencies. An advantage of ITCS working for "Former Teacher" is that, compared to traditional freelancing, ITCS platforms provide support for and simplify administrative tasks such as bidding, billing and payment, and client coordination.

"Outside of [ITCS platforms], I have had trouble with getting paid for my work and hearing back from clients in a timely fashion, and I have experienced business-side struggles of freelancing. On [ITCS platforms], I can relax and focus on doing quality work and spend less time running [my freelance] business."

ITCS platforms provide workers with a wide variety of projects on which to bid. This variety can allow ITCS workers to align their personal and professional interests with their technical skills.

"I … try to stick with jobs that allow me to use my background in education—I love to teach! … I have a dual background in both software development and education. I love keeping one

foot in both worlds, and [ITCS] has some of the best opportunities to do both. … Overall, [ITCS provides] me with opportunities that fit both of my major skillsets."

Because ITCS allows "Former Teacher" to work on tasks related to her education-based technical experience, she delivers on client expectations in unanticipated ways. When clients describe the context of the challenges that they are trying to solve, she can add her personal experience to her projects.

"Many of my clients are pleased at my communication style and enjoy learning to maintain their own software projects. I … am currently rebuilding a large site full of interactive math lessons for grades K to 8 [ages 5 or 6 up to 14]."

As with most ITCS workers, "Former Teacher" appreciates the flexibility that ITCS can provide. Her schedule flexibility enables her to participate in her hobbies and to take part in the community service programs that she values during traditional working hours:

"Freelancing lets me work on my own terms and to my own schedule. With such a flexible schedule, and no commute to work, I have the time and energy to volunteer with my local animal shelter, perform errands during non-rush hours in my city and do so much more in my personal life."

"Former Teacher" needs an income from working to meet her financial needs. However, being an ITCS worker enables her to earn money on her terms. Although workers in the gig economy give up the security and stability of a full-time job, they can still earn good money and have more time for personal interests. "Former Teacher" told us *"I make about as much as my last full-time job. (But with just 30-35 hours per week—yay!)"*

While "Former Teacher" recognizes there are many benefits from ITCS working, there are challenges on how interaction is managed between individual ITCS workers and the firms that employ them. Firms using ITCS need to recognize that the platforms provide limited integration tools and must be prepared to help facilitate interaction between workers. As "Former Teacher" put it:

"It would be nice to have a better way to communicate with larger teams, especially when multiple contractors have been hired for the same project. So far, I've been making do as a 'guest' in workrooms of other contractors on the same projects. I think it would also be fantastic to have a source control system (like GitHub) integrated directly into the workroom file system."

"Former Teacher's" use of ITCS demonstrates the benefits of non-IT professional experience (i.e., her teaching experience) that ITCS workers can bring to projects. One of the benefits of virtual work environments is the global scope of workers who can participate. Employers are not limited by geography in finding digital talent to work on projects. This means that employers can look for ITCS workers who have both technical skills and knowledge of the business context related to the tasks they post. Firms looking to use gig economy workers often focus on making tasks simple. But "Former Teacher" illustrates the value of describing the business problems, so that ITCS workers with specialized expertise can bid for projects that are of interest to them. This provides better problem solving for clients and greater satisfaction for ITCS workers.

Profile 3: Workforce Survivor

The "Workforce Survivor" is a 30-year-old single female with no children and a bachelor's degree. She was trained as a web designer and worked in traditional employment roles for many years. Unfortunately, health issues compromised her ability to work in a full-time role. For some ITCS workers, reasons such as age or health concerns have forced them out of traditional employment. As "Workforce Survivor" put it:

"I became a freelance worker because I [suffer from] with Crohn's Disease and [had] a blood clot, and no one would hire me [even though] I was perfectly capable."

Free from the confines of traditional work, "Workforce Survivor" now feels more fulfilled. As she put it:

"In ways, I have more freedoms than a standard job. … I feel more creative and happy."

While "Stay-at-home Dad" likes to challenge himself with new types of tasks on ITCS platforms, some workers are more concerned with selecting tasks that they know they will be able to complete successfully. When seeking ITCS work, "Workforce Survivor" focuses on skills that she already has. By restricting the types of

projects that she works on, she can reduce her risk of failure. She explains:

"I like the fact I can … find jobs that suit my skillset without being afraid of doing something wrong."

ITCS provides "Workforce Survivor" with a mechanism for finding work and generating income. By offering the opportunity to earn an income, ITCS provides participating digital workers with the dignity of working.

"I am closer and closer to my dream of holding my own in the world."

"Workforce Survivor" demonstrates that, for some workers, ITCS provides an environment where they can work around their perceived limitations. Whether those limitations are related to health or lack of skills, the variety of tasks available on ITCS platforms allows these individuals to find tasks they feel they can do, thereby providing an opportunity to earn an income.

Profile 4: Five-star Mom

"Five-star Mom" is a 43-year-old married mother with a graduate degree, and busy at home with five children. For her, it is important to earn a good income to support her large family, but it is just as important to be available when her kids need her. She had a traditional position in the digital sector but was not satisfied. Eventually, she lost her job but she does not regret leaving the formal workforce.

"To be honest, I wanted to get laid off. I hated the people I worked with—emotionally immature, gossiping, time wasting, babies, and I was expected to hold their hands. I had kids at home, I didn't want to work with kids at work."

ITCS allows "Five-star Mom" to have a better work-life balance. Working in this way allows her to have a flexible schedule both in the type of projects that she takes on, as well as the times of day she works. As "Five-star Mom" observed:

"[I] love being able to stay home in the mornings, send my kids off to school, then log in and work as much or as little as I want. Then when my kids start coming home at 2:15, I can stop working if I want or work a little more. I love the flexibility of being able to work my own hours (in my pajamas)."

The ad hoc nature of ITCS projects allows individuals to fit in work between other commitments. For many, ITCS working is the primary means of supporting their households, but the scalable nature of the work allows ITCS working to provide supplemental income as well.

"My husband was laid off and went back to school, which plunged our family below the poverty level. He is now starting a new job, and we are just able to make ends meet, with my income from [the ITCS platform] bridging the gap between what he makes and what we need to spend to support our five kids."

ITCS provides "Five-star Mom" with the opportunity to earn a good income, but she is able to reduce the number of hours she works to match her hectic family schedule. As she puts it:

"I do not want to work full time (I am not sure why 40 hours per week is the magical number for full time). I think working about 20-25 hours per week is ideal."

Previous research has found that for individuals with childcare responsibilities, the structure of digital work can be an obstacle to workforce participation.[20] "Five-star Mom" feels that, without the flexibility of ITCS, her hectic schedule would prevent her from participating in the digital workforce. Despite her high levels of digital skills, she expressed the following about what she would be doing if ITCS working was not available to her:

"[I would] eat snacks in my kitchen, get fat, watch a lot of TV; maybe occasionally clean my house; get depressed. I would probably not look for work outside of the home."

ITCS allows "Five-star Mom" to remain in the digital workforce and earn an income to help support her family and feel fulfilled in her professional contributions. ITCS platforms therefore provide IT leaders struggling to find digital talent with an additional source of talented workers.

As well as allowing workers to manage their schedules and workload, ITCS can also be liberating for those who feel stifled by traditional office environments. Working outside of a formal organization helps "Five-star Mom" feel a sense

20 A comprehensive analysis of the challenges of balancing work and family responsibilities is presented in Quesenberry, J. L., Trauth, E. M. and Morgan, A. J. "Understanding the 'Mommy Tracks': A Framework for Analyzing Work-Family Balance in the IT Workforce," *Information Resources Management Journal* (19:2), April, 2006, p. 37-53. Quesenberry2006

of freedom. The entrepreneurial nature of ITCS work is motivating for career development.

"The career pathway that is most attractive to me is to be able to do whatever I want. I want to be self-guided, with no manager or mentor. I want to work when I want, on projects that I want, and to turn down projects that I don't like. I am very, very spoiled, but also very smart and ambitious, and somehow things are working out well for me."

The flexibility of ITCS not only allows workers to better balance work and life responsibilities, but can also benefit employers because workers devote their most productive time to digital tasks, as emphasized by "Five-star Mom:"

"The client is not paying me for time when I am not at my very best. I would not be able to do that with a regular 9-to-5 job. There are times in the day when my brain gets full, and I step away from the computer, but with a regular job, I have to sit there and plow through a task that I did not want to do. It would not receive my best efforts, and I would grow resentful at not being able to step away and take a break. Working from home gives me the freedom to be flexible with my tasks, only working when I feel productive and focused."

The transparency of the data about workers provided by ITCS platforms facilitates new types of worker evaluation and recognition. For workers, there is value in building a profile on an ITCS platform that highlights their skills. The desire for high ratings on the platform encourages workers to perform well in the contracts that they are awarded, as illustrated by "Five-star Mom:"

"After a while, and this is the best part, I became a five-star worker, so when an employer posts a job that has keywords that match my profile, [the ITCS platform] recommends the top 10 employees in that category. My name shows up, so employers often will contact me directly and tell me about their jobs. [This means] I do not apply for jobs. There are enough clients who come to me, and I get to turn down jobs that I don't want and keep the ones I do want. That is my dream job."

For "Five-star Mom" there is real financial value in earning and maintaining a five-star rating from her customers. As she explains:

"I charged only $15 an hour when I first started. I attracted some clients, did a good job, got five-star feedback, then slowly raised my rates over time. I am still a five-star worker, and I now charge $60 an hour."

"Five-star Mom" demonstrates the value of ITCS worker data for clients when selecting workers for projects. She has worked hard to cultivate and maintain her five-star rating, which significantly influences the work that is available to her. She goes above and beyond in the service she provides to her clients to maintain her rating. The personal ownership that "Five-star Mom" takes of her rating is different from the firm-level customer satisfaction that traditional outsourcing companies provide. With ITCS, the employer understands not only what work they are requesting, but who will be doing that work. Employers provide direct feedback that affects the ITCS worker's ability to find future employment.

Some platforms also allow ITCS workers to rate employers. The alignment of performance metrics with employer satisfaction facilitates an environment of accountability.

"Five-star Mom" illustrates that, for workers who want to participate in the digital workforce but do not want to dedicate the time necessary to commit to a full-time job, ITCS can be a valuable employment option.

Profile 5: Prison Trained

"Prison Trained" is a 52-year-old male who spent nearly 20 years in prison. He is married with one adult daughter and has some college education but no degree. During his incarceration, "Prison Trained" was able to learn and develop technical digital skills, and to use those skills to add value to the prison. When he was released, he reintegrated himself into family life, including taking greater responsibility for the care of his disabled adult daughter.

"I spent 19+ years in prison. For the last 12 years, I worked as an assistant to the MIS Officer doing setup and maintenance of computers, light networking tasks, etc. During the down time, I learned Visual Basic Programming using MS Office and Visual Studio.net. Thus, when I was released a few months ago, I began looking for work in the computer field because it's something I am good at and like doing."

ITCS platforms can provide great value for workers like "Prison Trained," who has limited formal education and acquired his technical

Table 2: How ITCS Overcomes the Challenges of Traditional Digital Employment or Freelancing

	Challenges	Actions by Firms	ITCS Outcomes
Skill Development	Workers need to know what skills are required	Signal demand for new skills through posting tasks on ITCS platforms	Proactive ITCS workers develop new skills for emerging technologies
Business Context	Applying non-technical work experience to digital tasks	Task postings describe business problems that need to be addressed	ITCS workers with relevant professional experience attracted to the postings
Worker Confidence	Workers may be unsure of ability to complete tasks	Separate complex tasks from repetitive work	ITCS workers without specialized skills can complete repetitive work at lower rates
Shared Accountability	Impact of performance ratings on professional opportunities	Ensure commitments are honored and provide prompt feedback to workers	Shared accountability for task delivery success aligns worker/firm incentives
Worker Inclusion	Virtual work communities and worker inclusion	Avoid detailing unnecessary professional requirements	Access to digital talent with unusual career paths

skills in a non-traditional way. Worker ratings are important in ITCS, and these ratings come from feedback on the worker's projects, which reduces the emphasis on formal qualifications such as degrees or certifications.

"[ITCS] gives me the opportunity to do my thing without having to show any certifications or degrees (which I do not have) ... [the projects I work on allow me to] demonstrate my skills and abilities."

"Prison Trained" has family responsibilities that require time and attention, and ITCS working provides him with flexibility in both schedule and location.

"I have a disabled daughter who is confined to a wheelchair and requires extensive care. [ITCS] allows me a flexible schedule, where I can attend to family matters when needed without having to call in sick or take a day off. ... I work whatever hours are necessary to get the job done, even if it means working from a laptop in the waiting room of the doctor's office."

"Prison Trained" demonstrates the potential social value that can be provided by using ITCS platforms. Many employers aspire to achieve social responsibility goals, and social responsibility can be an especially high priority among technology workers. The experience of "Prison Trained" shows that ITCS can bring talent into the digital workforce that might otherwise be overlooked. By using these non-traditional sources of workers to meet critical digital needs, firms can demonstrate their social responsibility credentials to their traditional workforce.

Managerial Implications of ITCS for IT Leaders

Our descriptions of the representative profiles of ITCS workers show that ITCS can provide many potential benefits because it addresses many of the challenges common to traditional digital employment or freelancing. These challenges and the way that ITCS can help to overcome them are summarized in Table 2. By understanding the potential benefits, IT leaders can better understand the actions required to take full advantage of ITCS.

However, IT managers face many challenges to successfully using ITCS. Based on our review of ITCS platforms, and the feedback provided by

the ITCS workers who participated in our study, several recurring themes were evident.

Contract Administration Challenges

Contract administration (e.g., bid acceptance, service level agreements) for multiple disaggregated tasks adds an overhead cost to IT services obtained via ITCS platforms. Moreover, the roles and artifacts needed for procurement administration in an ITCS environment require skills that may differ from traditional outsourcing. Strong administrative functions, such as centralized IT procurement, provide effective governance and oversight of large contracts; however, the levels of documentation and oversight required for vendor management in large contracts are much too burdensome for smaller ITCS contracts, which often are worth less than $5,000. Organizations need to develop streamlined procurement processes for the governance of smaller contracts that carry less risk. They should also consider developing the role of "ITCS Coordinator" to manage the definition and administration of its ITCS contracts.

Task Definition Challenges

With traditional outsourcing, the client usually has a contract for a large, complex development project with one service provider. However, in an ITCS environment, firms must be able to divide a project into compartmentalized subunits of work, often less than 100 hours each.[21] The required level of decomposition can be achieved in various ways, such as through application architecture design or Agile sprint-based task definition.[22] Each subunit will require a separate contract with the chosen ITCS worker, and the need for multiple contracts introduces risks in successfully delivering the overall project. Using ITCS platforms may therefore require clients to assume broad responsibilities in IT project design and delivery that are not required when using traditional outsourcing providers.

As labor markets for digital workers continue to tighten, firms that successfully learn to use ITCS as a means of procuring technology services could gain significant benefits. Although the small structure of ITCS contracts may not be suitable for all types of service contracts,[23] the highly flexible nature of work delivery can be appropriate for certain types of projects, such as pilots or repetitive work.

Task Complexity Mix Challenges

Firms also need to carefully consider the structure of the tasks they post on ITCS platforms. By structuring tasks at varying degrees of complexity, they create opportunities for a variety of ITCS workers to participate. Posting tasks with lower levels of complexity attracts workers with lower billing rates. High-complexity tasks provide ITCS workers with opportunities for skill development. Posting tasks with varying levels of complexity increases the benefits of ITCS for both workers and the firm.

Actions for IT Leaders Considering Adopting ITCS

To effectively use ITCS, firms need to evaluate project activities in a different way from traditional outsourcing. Moreover, as the adoption of ITCS working gathers pace, they will also need to think differently about the nature of their IT vendor relationships. In an increasingly fragmented world of workers and sourcing companies, firms will need to take actions to 1) include ITCS in the sourcing portfolios, 2) change the role of contracts, 3) enable collaboration, 4) retain access to digital talent and 5) focus on outcomes-based management. These actions are summarized in Table 3 and described in full below.

21 Examples of ITCS project requests and common project sizes and durations can be viewed on platforms such as Freelancer (https://www.freelancer.com/?gclid=EAIaIQobChMI4O-EiNGI-3gIVi7TtCh3QkAFnEAAYASAAEgImjfD_BwE&ft_prog=ANU&ft_prog_id=223658061731) or Upwork https://www.upwork.com/?gclid=EAIaIQobChMIuce1o9GI3gIVpbXtCh2edgvOEAAYASAAEgLvEvD_BwE).

22 A summary of the practices for developing decomposed tasks for ITCS is provided in Taylor, J. "Crowdsourcing IT Work: A Three-Fold Perspective from the Workers, Buyers, and Platform Providers," Proceedings of the 2015 ACM SIGMIS Conference on Computers and People Research, Newport Beach, California, June 4-6, 2015, pp. 1-2.

23 An excellent summary of best practices for managing ITCS projects is provided in Nevo, D. and Kotlarsky, J. "Primary Vendor Capabilities in a Mediated Outsourcing Model: Can IT Service Providers Leverage Crowdsourcing?," *Decision Support Systems* (65:C), September 2014, pp. 17-27. Nevo2014

Table 3: Actions Needed to Successfully Use ITCS

Include ITCS in Your Sourcing Portfolio:
• Develop a portfolio of suppliers to address different types of IT tasks • Match fit of supplier to task characteristics
Change the Role of Contracts:
• Modify contract management practices to better match risk profiles • Fast–track low-risk contracts with limited legal enforceability
Enable Collaboration:
• Develop expertise in coordinating activities of ITCS workers • Provide means to facilitate collaboration between internal and ITCS workers
Retain Access to Digital Talent:
• Maintain access to talent leaving the traditional workforce • Provide mechanisms by which digital employees can customize work involvement as individual needs change
Focus on Outcome-based Management:
• Develop performance-management indicators based on outcomes, rather than activities • Adjust evaluation practices to emphasize due dates and quality expectations

1. Include ITCS in Your Sourcing Portfolio

ITCS platforms provide firms with another option for IT service delivery. Firms should consider developing a task-specific basis for organizing and managing sourcing portfolios. ITCS can be a useful source of talent for small, one-off activities that are common in pilot or DevOps[24] projects. By including ITCS in your sourcing portfolio, you can widen your access to talent. As several of our ITCS worker profiles demonstrated, ITCS platforms streamline workers, administrative tasks. Organizations that make effective use of ITCS will also find ways to use platform tools to streamline the administrative tasks of integrating individual contractors into their sourcing pool.

2. Change the Role of Contracts

Using ITCS will require an organization to think differently about contracts. To evaluate how ITCS relationships differ from current practices, an organization should start small, focusing initially on short, low-risk activities. With ITCS, projects are small, and the financial risks to both parties are minimal, which means traditional IT outsourcing contracts for large, complex projects will likely not be appropriate. ITCS platforms provide high levels of data transparency for past evaluations, of both workers and the firms that hire them, in the form of star ratings and written assessments. As demonstrated by "Five Star Mom's" commitment to her rating, the data transparency provided by ITCS platforms provides a better tool for managing accountability than traditional contracts.

3. Enable Collaboration

The structure of most ITCS platforms limits direct collaboration between individual workers. This can create challenges for projects that require more than one ITCS worker. An organization that uses ITCS for projects that require several workers needs to find ways for them to collaborate. By providing ITCS workers with access to tools such as shared online code repositories or shared communication platforms, IT managers can encourage collaboration between ITCS workers, as well as with the organization's traditional IT staff. "Former Teacher" highlights the challenge that many ITCS workers face in delivering usable code to their clients. It takes ITCS workers time to come up to speed on their clients' development environments. To facilitate coordination, in addition to providing technical tools, the hiring organization may need to appoint an internal employee as "ITCS coordinator," tasked with monitoring the administrative tasks associated with ITCS usage.

24 DevOps is a software development methodology that combines software development with information technology operations. The goal of DevOps is to shorten the systems development life cycle while also delivering features, fixes and updates frequently in close alignment with business objectives.

4. Retain Access to Digital Talent

A firm should have an HR strategy for retaining the services of IT workers who choose to leave the organization to become ITCS workers, like "Five-star Mom," who has all of the technical skills needed but does not want a full-time job. Some of the ITCS workers who participated in our study currently also hold full-time jobs, and 75% of these said they would leave traditional employment if they were able to generate enough work through crowdsourcing.[25] As the market for IT contractors grows, more workers will elect to pursue contract-based ITCS opportunities.[26] Some full-time employees may already be considering doing this. By engaging with the ITCS workforce, firms may be able to maintain access to former employees who have left traditional employment for the autonomy of contract labor.

5. Focus on Outcome-based Management

Organizations often rely on factors such as hours in the office or attendance policies to evaluate worker productivity. Productivity metrics are often time based, meaning that managers focus on how long it will take to complete a task. When transitioning to an ITCS environment, due dates will still be important, but in managing task outputs, greater emphasis will be placed on how much the task costs. As "Stay-at-home Dad" and "Workforce Survivor" demonstrate, ITCS workers will take on different types of tasks at different times based on their individual needs. If organizations focus on what and when work needs to be done, rather than how many hours it takes someone to do it, they will be able to access the broader and more diverse talent pool available via ITCS.

Concluding Comments

The rise of crowdsourcing is bringing substantial and unexpected changes to the structure and composition of the workforce. To prepare IT leaders for these changes, we have provided insights into how they can leverage the gig economy in the tightening IT talent market. The profiles of gig workers participating in ITCS reveal the benefits of flexible work structures for workers, firms and society. IT leaders will find that, in addition to tapping a new and talented source of workers, ITCS also helps them retain access to talented former employees who might otherwise leave the IT workforce. But for ITCS to be a viable sourcing strategy, IT managers have to be proactive in creating innovative work structures that address the administrative challenges associated with managing small tasks.

While regulators and scholars continue to evaluate the appropriate worker protections and regulatory oversight required for these emerging work structures,[27] we urge IT leaders to fully embrace the opportunities provided by ITCS. By developing work structures that broaden the participation of individuals in digital work, IT leaders will not only mitigate some of the challenges associated with the pending shortage of digital talent, but also provide the dignity of work to individuals who would otherwise be in the shadows and unable to lead meaningful lives.

Appendix 1: ITCS Platform Review Method

In carrying out our assessment of existing ITCS platforms, we used a design-based process to develop our recommendations. Our objective in using this approach was to identify ways in which the design of the procurement process, which is embedded in a digital platform, could be improved to better support ITCS. The approach[28] is based on earlier work by Takeda[29] and comprises five phases:

1. Identification of the research problem (Awareness)
2. Suggestion of the key concepts needed to solve the research problem (Suggestion)
3. Implementation of a solution to the problem (Development)

25 Further exploration of the attitudes of current digital workers towards leaving traditional digital employment in favor of full-time crowdsourding can be found in Taylor, J. and Joshi, K.D., "Joining the crowd: The career anchors of information technology workers participating in crowdsourcing," *Information Systems Journal*.

Taylor2019

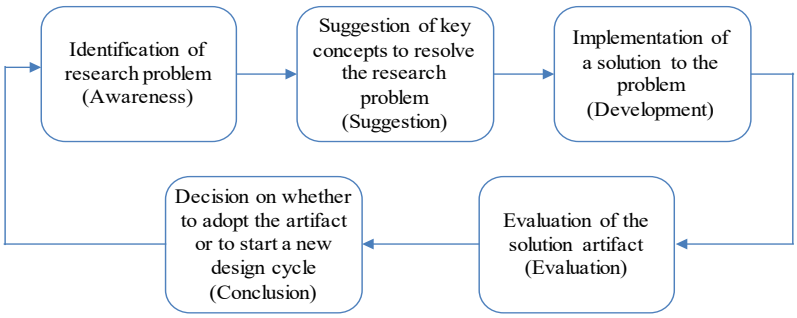
26 Many experts expect contract workers to constitute 50% of the workforce by 2028. See, for example, Noguchi, Y., op. cit., January 22, 2018.

27 The potential regulatory challenges of crowdsourcing are explored in Williard, R. P., op. cit., January 2017.

28 Curtis, B., Kellner, M. I. and Over, J., op. cit., September 1992.

29 An in-depth description of the process for conducting this type of design can be found in Takeda, H., Veerkamp, P. and Yoshikawa, H. "Modeling Design Process," *AI magazine* (11:4), Winter 1990, pp. 37-48.

Design Science Analysis Process



4. Evaluation of the solution artifact (Evaluation)
5. Decision on whether to adopt the artifact or to start a new design cycle (Conclusion)

A general flow of this design process is depicted in the figure below.

Appendix 2: ITCS Worker Feedback Review Method

In developing this article, we collected open-ended survey data from 25 crowdworkers who use three different ITCS platforms. The purpose of the survey was to capture these ITCS worker's attitudes to, interest in and experiences of working on crowdsourced technology projects. Respondents were compensated for their time to complete the survey, which took an average of approximately one hour. The survey included 39 questions aimed at understanding the why, how, what, challenge and opportunities as perceived by the respondents. Workers were randomly selected for participation in the survey to avoid any bias resulting from only surveying workers recommended by the platforms. Initially we struggled to gain responses from workers because we did not have an "employer rating" on the respective ITCS platforms. However, once we had successfully paid our first respondent and received a five-star employer rating, we had a response rate of well over 90% for invited workers. A breakdown of the respondents' demographics is shown below.

We analyzed the survey responses to identify common motivations and outcomes. The approach used to analyze the text examined the cause-and-effect descriptions of work activities. We have include selected quotes from the respondents within the main body of the article to illustrate representative feedback from the ITCS workers who participated in our study. Our analysis of the respondents' perceptions focused on revealing advice for IT leaders who want to engage with ITCS.

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Demographics of Survey Respondents

Number of Respondents	**25**
Gender	
Men	**14**
Women	**11**
Age Average (standard deviation)	**36.16 (12.55)**
Range	**18-60**
Frequency 18-24	**16%**
Frequency 25-30	**24%**
Frequency 31-40	**28%**
Frequency 41-50	**16%**
Frequency 50+	**16%**
Household Income	
< $25,000 per year	**28%**
$25,000-$49,999	**16%**
$50,000-$74,999	**20%**
$75,000-$99,999	**4%**
$100,00 or more	**32%**
ITCS Experience	
< 3 months	**8%**
>3 months < 6 months	**12%**
> 6 months < 1 year	**8%**
> 1 year < 3 years	**48%**
> 3 years < 5 years	**4%**
>5 years	**20%**
Education Level	
Some high school	**4%**
High school graduate	**4%**
Some college but no degree	**16%**
Associate's degree	**4%**
Bachelor's degree	**48%**
Graduate degree	**24%**

enabled innovation, value sensitive designs and healthcare IT. Her research has appeared in journals such as *MIS Quarterly, Information Systems Research* and *Decision Support Systems*.